INTERNATIONAL COUNCIL ON MONUMENTS AND SITES
CONSEIL INTERNATIONAL DES MONUMENTS ET DES SITES
CONSEJO INTERNACIONAL DE MONUMENTOS Y SITIOS
МЕЖДУНАРОДНЫЙ СОВЕТ ПО ВОПРОСАМ ПАМЯТНИКОВ И ДОСТОПРИМЕЧАТЕЛЬНЫХ МЕСТ

CULTURAL HERITAGE IN THE ARCTIC AND ANTARCTIC REGIONS

This publication is compiled and edited for
the International Polar Heritage Committee of ICOMOS by :
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and
PAUL CHAPLIN – Secretary General IPHC

ICOMOS
MONUMENTS AND SITES
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MONUMENTOS Y SITIOS
VIII

The International Polar Heritage Committee (IPHC) is a special international scientific committee within ICOMOS. It specialises in polar (Arctic and Antarctic) heritage.

The IPHC consists of representatives appointed by ICOMOS National Committees from countries with an active polar interest. It is a non-political organisation.

ICOMOS is a non-governmental organisation of professional cultural heritage workers, which serves as an advisory body to UNESCO on world heritage matters.

The objectives of the IPHC are to:

- Promote international co-operation in the protection and conservation of non-indigenous heritage in the Arctic and Antarctic;
- Consult and co-operate with Arctic indigenous peoples regarding heritage of cross-cultural significance
- Provide a forum for interchange of experience, ideas, knowledge, and the results of research between administrators, archaeologists, conservators, historians, legislators and other professionals
- Promote international studies and projects
- Expand technical co-operation by fostering links with specialised institutions.

The International Polar Heritage Committee would like to express our thanks to :

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The Directorate supports the IPHC Secretariat which is based in Norway, and has made a major contribution to this publication

Front cover: Shackleton's 1908 hut at Cape Royds, Ross Island, Antarctica. Originally built for his "Nimrod" expedition, the hut later provided temporary shelter and some supplies for his Ross Sea party who were stranded in the area in 1915 after their ship was blown out to sea. At the same time Shackleton was fighting to survive with "Endurance" on the other side of the continent. (Kirsti K Paulsen)

Back cover: Antarctichamn, north-east Greenland. A large Norwegian hunting and trapping cabin from the 1930s. The cabin was repaired by Danish and Norwegian volunteers a few years ago, only a year before a freak avalanche knocked it into the sea. The avalanche was possibly a result of changing climate conditions. (Susan Barr)

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PREFACE

The new series of “Monuments and Sites” will not only underline ICOMOS' role as advisory body of UNESCO by contributions on the history and restoration of outstanding monuments and sites on the World Heritage List, but should also reflect the diversity of ICOMOS' tasks concerning the protection and conservation of our cultural heritage in general. Focussing on their special issues all our International Scientific Committees should contribute to this new series. Therefore, I welcome that after the International Committee for Vernacular Architecture (see M&S vol. 5, *Vernacular Architecture*, Munich 2002) the recently founded ICOMOS Polar Heritage Committee is now presenting another example of the work of our International Committees.

This publication, beautifully designed thanks to the generous support from the Norwegian Directorate for Cultural Heritage, points at the very special dangers facing the polar heritage in the Arctic and Antarctic. Examples of these dangers were already introduced in the last two issues of the *ICOMOS World Report on Monuments and Sites in Danger (Heritage at Risk 2001/2002*, pp. 232-234; *Heritage at Risk 2002/2003*, pp. 233-235). Polar heritage is a witness to the pioneer spirit of the polar explorers from various countries and keeps alive the memory of sometimes highly dramatic events during the race to explore the last untouched regions of the world. The ephemeral character of this fragile heritage scattered across the polar wilderness shows once more that we today define the term “monuments and sites“ as places of memory and historic sites in the widest sense. Here the task of the monument conservation authorities is to protect and save the last traces, including of course written and pictorial documentations of what will be irretrievably lost due to natural processes of decay. In view of the particular aesthetic quality of these photographic sources certain parallels between the results of our documentation and conservation endeavours on the one hand and tendencies of 20th-century art, especially the international art movement since the 1970s dedicated to “securing traces“ on the other hand, suggest themselves.

Michael Petzet.

The documentation by the Polar Heritage Committee proves that under these circumstances even “rubbish“ can become relics. Also in this case conservationists who are sometimes reproached for practising a modern cult of relics are able to justify their concern over the “historic fabric“ by maintaining that only the monuments which have been preserved on the authentic places and in their authentic materials despite all the scars of time and the growing signs of decay are authentic documents of human history. In this sense the initiatives of our Polar Heritage Committee headed by Susan Barr will continue to help safeguard the irreplaceable historic resources of the polar regions.

Michael Petzet
President of ICOMOS

Monuments and sites have different associations for different people. For some they are the monumental constructions of great past civilisations. For others the well-known and well-loved tourist attractions nearby their own home. Fundamentally, size and global importance have no place in the definition. The important factor is what they represent and ultimately, how we appreciate and take care of them. The ICOMOS organisation stretches to all corners of the globe. There are more than 107 national committees representing cultural heritage work internationally, and 21 special scientific committees that work specifically with expertise on more limited aspects of our global cultural heritage. The ICOMOS International Polar Heritage Committee (IPHC) has existed only since November 2000, but is already fulfilling its aim to unite experts on the cultural heritage of the polar areas, both Arctic and Antarctic, and to pool the common experience of heritage work in these areas which are on the borderline for human life and work on our planet.

Susan Barr.

There are many polar heritage professionals at work in the far north and south, and in countries in between. The articles contained in this volume of “Monuments and Sites“ give only a sample of the wealth of expertise and of the challenges to be faced. The IPHC is, however, glad to be able to present this selection of articles and to contribute to expanding the multitude of fields that are collected under the auspices of the International Council on Monuments and Sites.

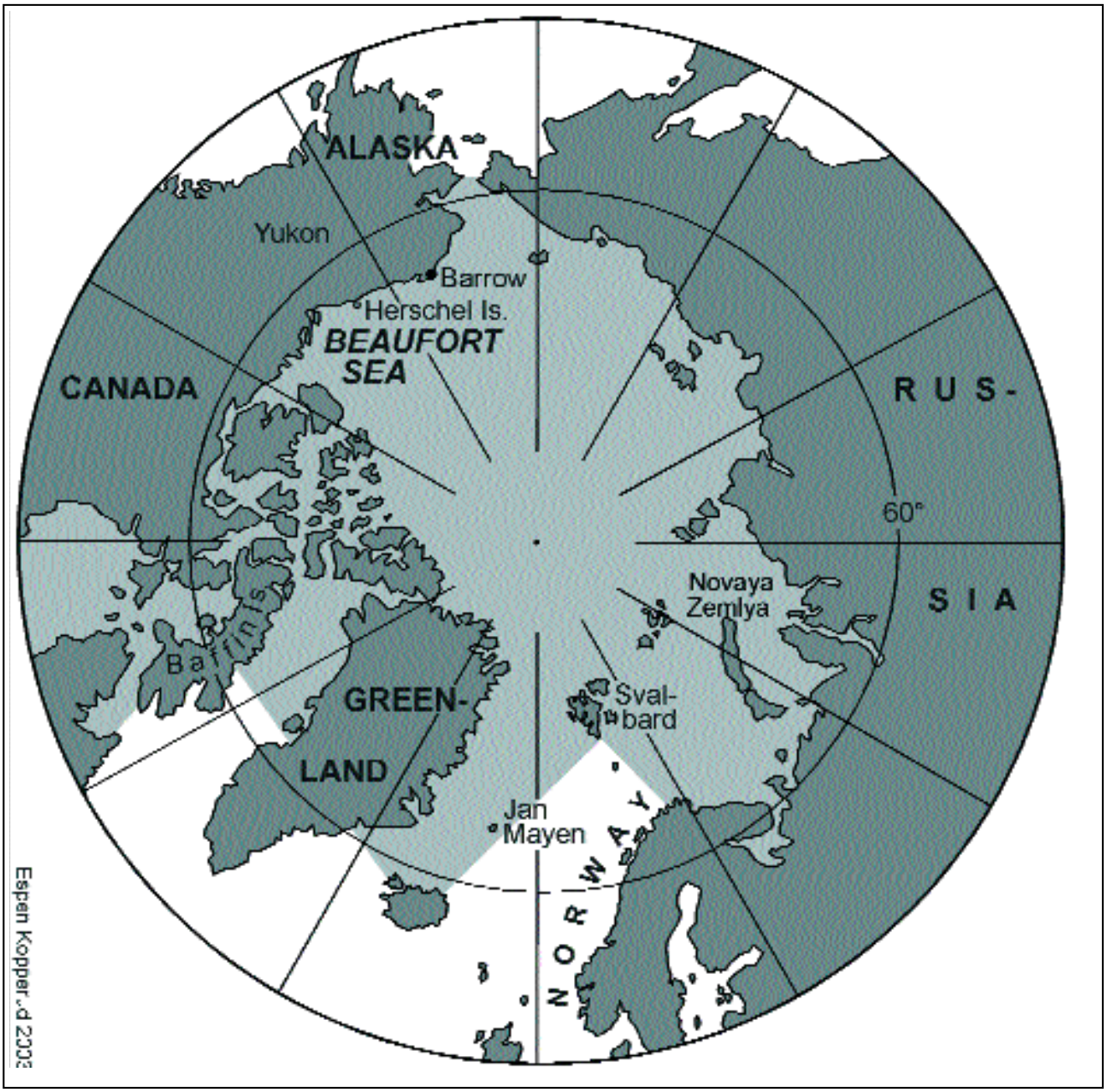
Susan Barr
President of IPHC

The Antarctic Region

land

ice

sea



The Arctic Region

land

ice

sea

POLAR MONUMENTS AND SITES: CULTURAL HERITAGE WORK IN THE ARCTIC AND ANTARCTIC REGIONS

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AN OVERVIEW OF POLAR HERITAGE SITES

Paul Chaplin and Susan Barr

ANTARCTIC MONUMENTS AND SITES

Paul Chaplin

While the first human contact with the Antarctic continent was not much more than a century ago, the first mention of a mysterious 'Great Southern Continent' in fact goes back to early Grecian times. It was not until the late 1700's however that explorers seeking the great white continent began to discover new islands in the southern oceans and the potential harvest from these new areas quickly began to attract sealers and whalers.

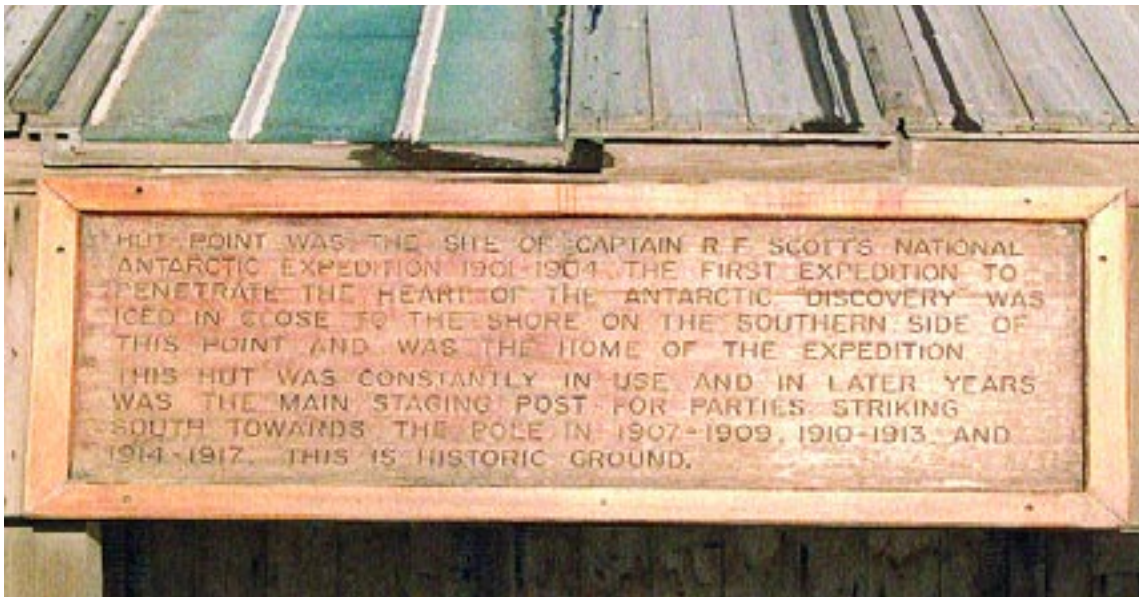
Remains from these first activities can now be found in many parts of the Antarctic and sub-Antarctic latitudes and in terms of cultural heritage, they are just as significant as the better known historic sites left by the heroic-era (1899-1915) explorers whose main goal was the South Pole.

A rich mixture of cultural heritage is now scattered over a large proportion of the southern hemisphere and this creates unique challenges for those seeking to preserve and protect it. The diversity and complexity of these historic sites is daunting. The Antarctic Treaty currently lists 76 such sites on the continent itself but this represents only a small proportion of the total number in the wider polar region.

At one end of the scale are major structures such as the derelict whaling station at Grytviken in South Georgia near the northern limits of the region, while sites at the southern extremities include the historic huts of the so-called 'heroic-era' explorers in the Ross Sea region.

Rusting digestors at the whaling station on Deception Island. (Paul Chaplin)

Smaller in scale, but no less significant, are numerous sites where rock and other shelters were built in response to situations where survival depended on them. Classic examples are Otto Nordenskjöld's stone hut (1903) on Paulet island and the shelter built at Cape Crozier on Ross Island by Edward Wilson and his party during their 1911 winter journey from Cape Evans to discover the secrets of the breeding cycle of the Emperor penguin.



Scott's 1902 "Discovery" hut at Hut Point, Ross Island. (Paul Chaplin)

These explorers also created many campsites and left numerous supply depots, message posts and marker cairns in the course of their discoveries. Evidence of these still remains and discarded equipment and supplies can be found at many such sites.

Early explorers in these regions knew less about their destination than the first men to land on the Moon knew about theirs. The risks were great and many lives were lost in the name of discovery, science and commercial gain. Some of these lives are commemorated by the graves that were left behind. First to be laid to rest on the continent was Nicolai Hanson, a Norwegian biologist and member of Carsten Borchgrevink's Southern Cross Expedition of 1898-1900. His grave lies at the top of the ridge at Cape Adare, while others,

Nordenskj ld's 1903 stone shelter on Paulet Island – Antarctic Peninsula. (Paul Chaplin)

whose bodies have never been found, are commemorated by memorial crosses and plaques.

Places of heritage value are not however limited to these more elite and widely recognised sites. Many historic sites are more recent. A widely accepted guideline now used when defining places as having historic importance, is to include everything associated with events occurring prior to the current era of Antarctic activity. The 'current era' is considered to have begun in 1957 with the new wave of scientific research that started with the International Geophysical Year (IGY). Since that time there has been an uninterrupted human presence on the continent.

Hanson's grave (1899) at Cape Adare. (Aaron Smail)

In the 42 years between the 'heroic-era' that ended with the rescue of Shackleton's Ross Sea party in 1917, and the beginning of the IGY period, there was not a lot of activity on the continent and some of the events that did occur during this time are often overlooked.

By 1917, apart from a route to the Pole, the only areas of Antarctica that had been identified and mapped were a few small pockets of land near the coast. Many nations at this time had territorial as well as commercial ambitions and, while funds were often short, there was a continuing drive for discovery, knowledge and resources.

Whaling operations continued and the first attempts to use aircraft on the continent began. Americans Richard Byrd and Lincoln Ellsworth both mounted aerial survey expeditions and in 1947 United States military forces supported 2 massive survey projects. Operation Highjump and Operation Windmill reflected a growing awareness of the strategic importance of the continent during the closing stages of

The British 'Operation Tabarin' base (1944-45) at Port Lockroy. (Paul Chaplin)

Scott's Northern Party Hut (1911) at Cape Adare. (Paul Chaplin)

World War II.

Immediately prior to this the British had also extended their presence in the South Atlantic down into the Antarctic Peninsula area. Operation Tabarin was a response to increased German activity in the region and a small number new bases were established. All these events and the physical remains of them are also historically significant.

Unfortunately, the diversity and significance of this rich collection of cultural heritage cannot be adequately described in a publication such as this. Each site has a story to tell and an important place in our history. Fortunately the history is well documented - the challenge now is for heritage protection professionals to ensure the physical evidence of that history is preserved. Once lost it can never be regained.

ARCTIC MONUMENTS AND SITES

Susan Barr

The Arctic is not a region that is as easy to identify as the Antarctic. The latter is a large continent surrounded by oceans, while the former is comprised of land masses surrounding a mostly ice-covered sea. Where the land masses are continents, there is no clear division that indicates where the Arctic zone begins. Almost half of the length of Norway lies above the Arctic Circle at 66º30', yet the warm waters of the Gulf Stream bring a mild climate to much of the region. On the other hand southern Greenland lies below the Arctic Circle, yet the landscape of the region is dominated by a huge ice cap. Generally today the Arctic is defined as reaching south to the July isotherm +10ºC at sea level, which is more or less the border between forest and tundra. The term High Arctic is often used to describe the climatically most extreme part of the Arctic, which bears a closer resemblance to the Antarctic.

The last unpopulated areas of the High Arctic, northernmost North America and Greenland, were probably reached and peopled originally from Asia by small, scattered groups of what we now call Paleo-Eskimos. They gradually moved eastwards across Canada, reaching Greenland by about 2500 bc, or 4500 years ago. These family groups lived right on the edge of where it was climatically possible for humans to survive, and small negative fluctuations in the climate meant that they died out or moved away, leaving the region devoid of human life until a new group arrived as the climate conditions again slightly improved. Our present-day insight into these earliest cultures is gained from the small tent rings (rings of stones used to hold down the edges of the animal-skin tent), hearth stones and other remains of minimal dwelling sites still to be seen on the surface of the open tundra.

A Russian (Pomor) house site from the early 19th century in northeast Svalbard. An orthodox cross can be seen in the background. (Lisen Roll)

The simple remains of Fridtjof Nansen's wintering site 1895-96 on Franz Josef Land are now marked by a memorial post. Otherwise the small heap of fallen stone walls and log roof-pole hardly do justice to the great symbolic nature of this site for Norwegian history. (Susan Barr)

Among the first explorers and colonisers to arrive in the region from what by then could be called non-indigenous cultures, the Norse (Vikings) who emigrated from Norway to Iceland from around 870 and then on to southern Greenland in the 980s, were primarily farmers. Also they were defeated by worsening climatic conditions at the end of the 15th century, when the Norse Greenlandic colonies disappeared, leaving the ruins of their farms and settlements behind. Only a few decades later the European seafaring nations were looking northwards to find new trading seaways to Asia, the fabled Northwest and Northeast Passages north of the

Remains of Roald Amundsen's ship "Maud" lying in Cambridge Bay, north Canada. The ship is a national monument for Norway, but is also part of the history of its present location, where it adds to the tourist potential of the area. (Susan Barr)

The aerial transport system for coal that goes through the middle of the present settlement of Longyearbyen, Svalbard. Although the cables were taken down when the transport system went out of use in 1986, it is still easy to see how the system worked. The entire system was protected by law in 2003. (Susan Barr)

The Russian Cold War military base Srednij on Severnaja Zemlja, north of Siberia. Such stations played an important role in recent history and should be considered for detailed documentation or even preservation. (Susan Barr)

Camp Ziegler on Franz Josef Land. An American explorer's base now in Russian territory. (Susan Barr)

American and Euro-Asian continents. Efforts to find these routes led over the next 350 years both to death and enormous sufferings for hundreds of men facing the cold and winter darkness with inadequate knowledge and means, as well as to the gradual opening up and mapping of the Arctic regions. They also left for future archaeologists, historians, conservators and tourists the material evidence of their fleeting presence: campsites, ship wrecks, wintering dwellings, cairns, graves and artefacts. Some of the later explorers operated in both the Arctic and the Antarctic, creating common links to the monuments and sites of both polar regions. The Arctic regions, however, still remained the haunts of the indigenous populations, and only a few non-indigenous individuals or groups braved life and work there.

It was not until the 1930s and the steady technical development within air transportation that most of the Arctic up to and including the Ocean around the North Pole could be said to be more or less discovered and mapped for the outside world. When the first aircraft, an airship, floated over the North Pole from Svalbard

In the middle of the picture stands the mooring mast from the first airship expedition over the North Pole, 1926. Ny-lesund, Svalbard. (Susan Barr)

A Danish patrol hut from 1943–44 in northeast Greenland. The site is called Daumannsbukta (Dead Man s Bay) because of the remains of early Eskimo dwellings and graves nearby, e.g. in the picture foreground. (Susan Barr)

(Spitsbergen) to Alaska in 1926, the Norwegian-American-Italian crew were still unsure whether there might be new lands to be found between the North Pole and the known Alaskan coast. By this time, however, the lands and islands which we now know as the most-northerly land masses, were in full use by mainly temporary groups of people from more-southerly areas, of whom almost all were there to exploit the natural resources.

The Norwegian archipelago of Svalbard, of which Spitsbergen is the main island, is a typical example of the way that "visitors" to the Arctic have used the area. Having never had an indigenous population it is not insulting any original inhabitants to state that the archipelago was discovered in 1596, although Viking sailors may have approached the shores as early as 1194. Owing to the sea ice blocking navigation also through much of summer, the extent of the islands was not fully known until the 20th century. Exploitation of the large stocks of whales and walrus started in the early 1600s, leaving us the first tangible remains on the shores: the sites of land stations for boiling the blubber to oil, and many hundreds of graves from the whalers and sailors who met their deaths from accident and illness during the 1600s and 1700s. Winter hunting groups from north-west Russia (Pomors from "Pomorje" = by the White Sea) were the next to arrive, in the mid-1700s, to exploit other populations of wildlife, including seals, reindeer, foxes and polar bears. Also they left behind graves, as well as cabins, large wooden crosses, artefacts and some wreckage from their small, characteristic ships. Norwegian trappers replaced the Pomors in the last half of the 19th century and left their own types of cabins, some of which are still in use today, although mainly for recreational purposes. Mining, particularly for coal, started around the year 1900, and still continues today, although the remains of many failed mining attempts are scattered along the central west coast of Spitsbergen.

All around the circum-Arctic similar monuments and sites are to be found relating to exploration, fishing and whaling, hunting and trapping, scientific expeditions, missionary work, mineral exploitation, trading, and national annexation attempts. From the 20th century can be added meteorological stations, military bases, airfields and scientific bases. Because of the transitory nature of many of these activities, cultural heritage from right up to modern times can be considered as worthy of protection as monuments to concluded activities and periods.

POLAR MONUMENTS AND SITES

An introduction

Susan Barr

Etah, north-west Greenland, used as a base for several years by Robert E. Peary, whose expeditions 1886-1909 led to his claim to have been the first to reach the North Pole. (Susan Barr)

The following collection of articles concerns the cultural heritage of the Arctic and Antarctic regions, areas that often are considered to be barren and ice-covered, and devoid of material signs of previous human habitation and activities. The last great wilderness areas on earth. True enough most of the Antarctic continent is deeply covered in ice, and large areas of the High Arctic are permanently glaciated. However, man's adaptation to difficult environments knows no bounds, and even nunataks (the tops of mountains sticking up over the ice) deep in the Antarctic continent can contain cairns and depots that show that men have passed that way before us. Both exploration and science, and the eternal quest for new natural resources have brought men to the furthest ends of the earth, literally in fact, as the North and South Poles have always exerted a particular force on those searching for adventure and glory. With its relatively easier access and relatively milder climate than the Antarctic, the Arctic has felt the footsteps of men along most of its shores and much of its inland, even though the prints may not immediately be visible to the untrained eye. In fact the recently-agreed definition of wilderness as it relates to the Norwegian High Arctic archipelago of Svalbard (74°-81°N) incorporates the acknowledgment that monuments and sites are an integral part of the "pristine" wilderness:

> [Svalbard's wilderness is defined as] "Large, continuous natural areas which to an insignificant degree are affected by human activity, which are free of heavier, technical intervention and damage to nature in the form of local pollution, where the biological diversity is intact and where animals and plants are regulated by natural, ecological processes, and where cultural monuments and sites are secured as important witnesses to historical exploitation."

Indigenous and non-indigenous polar heritage

In the Arctic the indigenous heritage obviously plays a large part in the complete picture of the material imprint of man. It therefore needs to be explained why indigenous heritage is not a primary subject for the ICOMOS

International Polar Heritage Committee (IPHC). The IPHC was founded with the aim of bringing together expertise and promoting the exchange of experience concerning the protection of the cultural heritage of the Arctic and the Antarctic. The members are expected to be professionals who are actively engaged in some aspect of polar heritage conservation work, be it administration, archaeology, technical conservation or otherwise. It was made clear from the start that the field of work for the committee was the *non-indigenous* heritage in the Arctic and Antarctic. Considering both the earlier and current importance of the indigenous peoples of the Arctic and their considerable impact in the form of monuments and sites around the arctic region, this limitation may for some seem to be both incomprehensible and unfair.

The IPHC has the greatest understanding and respect for the indigenous heritage of the Arctic, and several of its members also work with aspects of this heritage in their daily jobs. In many areas the indigenous and non-indigenous heritage are intertwined in all heritage work, and the IPHC has laid emphasis on establishing links with persons and organisations representing indigenous cultural heritage work in the Arctic. These connections will be steadily expanded as the mutual need may arise.

If we concentrate on other aspects of polar heritage than the indigenous, what is left ? What remains is what we have chosen to call “visitor heritage“, the monuments and sites that are a result of shorter or longer visits to the polar areas by persons who came from cultures outside the polar regions, including such groups as explorers, scientists, miners, military personnel, hunters and trappers. They have left behind such sites and objects as small buildings, cairns, shipwrecks, mining works, whaling stations, campsites, scientific bases, military stations and graves. These monuments and sites differ from the indigenous heritage in several significant ways:

- They represent techniques and materials that are usually very foreign to the traditional types of the region. The visitors often brought the materials with them and constructed them according to typical practice at home. Where forced and unexpected winterings occurred and shelters had to be built from local materials on hand, they still did not represent what could be called indigenous vernacular architecture.
- They represent occupations and objectives that were foreign to the region, such as scientific exploration and industrial resource exploitation, and thus have no basis in the local or regional indigenous culture.
- They relate to practices, history and archives in the country of origin and cannot be studied and analysed without due regard for this connection.
- They may be so foreign to the existing indigenous culture that they may not be considered part of the local heritage to be allotted their share of limited conservation resources.

Jackson Island, Franz Josef Land, where the Norwegian polar heroes Fridtjof Nansen and Hjalmar Johansen spent the winter 1895-96 in a rough stone shelter. The remains of the shelter are an example of one country's important monument in another country's territory in the Arctic. (Susan Barr)

- They can be regarded as “foreign elements“ also in the political sense in that they in many cases relate to citizens from an entirely different country than the present national area where they are found. This can, for example, apply to Dutch heritage in the Norwegian Arctic, American heritage in Arctic Russia, Norwegian heritage in Arctic Canada, and so on. Proper and successful management therefore implies a degree of cooperation between representatives of the two nations. In some cases this may involve more than two nations, as some sites may be the result of multi-national activities.

Greenland, northern Canada, Alaska and northern Russia have long and rich indigenous histories, while the Antarctic and the Norwegian Arctic (Svalbard and Jan Mayen) have never had indigenous populations. Just as the visitor heritage of the Arctic presents a number of different problems and solutions from those of much of the indigenous heritage, so can it on the other hand be regarded as more or less of the same type as that of the Antarctic, including the peri-Antarctic islands. Exploration and exploitation of the Arctic from more temperate areas started earlier than similar activity in Antarctica, but the motivations, actions and results were very similar. From the 19th century it was often also the same persons who were involved in both regions. Thus experts working on Antarctic heritage today will have their nearest colleagues dealing with similar matters amongst the experts who work with Arctic visitor heritage, and those working with visitor heritage in the Arctic will find more common challenges to discuss with the Antarctic experts than with experts on indigenous heritage in their own area.

Two of the articles in this compendium, one from northern Alaska and one from the Canadian western Arctic, describe the intertwining of indigenous and non-indigenous cultural heritage in their areas, and show how these can be mutually supporting. At the most-northerly point in Alaska the emphasis has been put on mutual cooperation between scientists and the indigenous population with active reuse benefiting both parts and the preservation of historical buildings and other cultural heritage. The description of a particular area on the Arctic Yukon coastline shows how both indigenous and visitor cultural heritage traditionally have been intermixed to the extent that they have to be treated together by expertise familiar with both culture spheres.

Particular features of polar heritage sites

Although a majority of the monuments and sites of the polar regions are modest in size and complexity com-

The abandoned whaling station of Grytviken, South Georgia is a big problem for conservationists with its mass of buildings, machinery and pipes. The British authorities are currently removing dangerous asbestos material. (Susan Barr)

pared with those in more temperate zones, also the polar areas can have large and complicated sites that need to be managed. Earlier scientific bases often present a mass of buildings, fuel depots, antennas, and rubbish dumps that need to be analysed and considered. Sites of complicated resource exploitation and refinement are also typical for both areas. Grytviken in the sub-Antarctic, a whaling station in use from 1904-65, is an important monument to earlier industrial activities in an extreme environment, and the need to conserve it as an

The remains of a German aircraft from the 2nd World War lie on a hillside on volcanic Jan Mayen island in the Norwegian Arctic. Such remains are considered protected heritage. (Susan Barr)

important heritage site is well recognised. However, the preservation of a large mass of structures, some of them containing considerable amounts of asbestos, in the face of climatic challenges and steadily increasing tourism presents enormous problems not least of the financial kind. At the other end of the globe the recently post-*glasnost* military bases in the Russian Arctic need consideration as cultural sites that should be documented and considered for possible preservation, at least of chosen examples. An outline of some of the technical conservation problems facing conservators of extreme polar sites and artifacts is particularly given in an article taking its main basis from internationally well-known Antarctic sites. Themes such as the biological (e.g. fungi and micro-organisms) and non-biological (e.g. UV-light and salts) degradation of wood are described in more detail in the succeeding article.

Small and very small wooden cabins and huts are a common feature of the visitor cultural heritage of both polar areas. The pioneers moving into these areas for shorter or longer stays invariably brought their shelters with them, either from necessity or from lack of knowledge of or regard for local possibilities and traditions. Prefabricated wooden buildings housed both the early explorer, the scientists, the trapper and the miner. In the Antarctic such cabins housed the expeditions of Robert Scott, Ernest Shackleton, Carsten Borchgrevink and Douglas Mawson. Today they present both irresistible attractions for tourism, and some of the largest problems for conservators and heritage managers. Some of the general problems of polar heritage work are outlined in the first article, while a method of tackling these problems is presented in the description of the management plan process for Mawson's huts. Although describing a specific process, the article describes guidelines which can be applicable for management processes for a wider variety of heritage monuments and sites.

A 16/17th century graveyard established near the coast in Svalbard is now rapidly being eroded into the sea. (Trygve Aas)

One of the common challenges facing the modest and "non-monumental" sites in the polar regions is the fine line that has to be drawn between what shall be classified as rubbish or as artifacts. Age in itself is not a definitive criterion for designation of cultural heritage in the polar areas. It lies in the nature of visiting cultures that they can come, and they can go again. Monuments and sites from various now-closed chapters of human activities will thus become eligible for consideration as heritage worthy of conservation, even if they are relatively new. This can apply to recent mining ventures and scientific and military bases, as much as to expeditions of discovery in the Heroic Age of polar travel. In the Norwegian High Arctic all cultural remains predating 1946 (the end of World War II) have been declared protected cultural heritage, while in the Antarctic the start of the International Geophysical Year (IGY) 1957-58 has been declared the time limit for automatic consideration as cultural heritage worthy of protection. Dumps of fuel drums, food cans, glass bottles and other apparent debris often occasion demands for clear ups from those who cannot see the historical value of left-behind artifacts

from the later 20th century. The problem of rubbish contra artifact is addressed in an article that particularly describes the challenge as it is associated with historical bases and stations in the Antarctic, but the description applies as much to the Arctic as well.

Tourism is both a blessing and a problem in the vulnerable polar areas. On the one hand visiting and experiencing historical sites in these areas certainly creates apostles who spread the word of the need to preserve such sites. On the other hand the fragile polar nature can only tolerate a fraction of the wear and tear borne by sites in more temperate zones before irreparable damage is done. A couple of the articles touch on this complexity as it relates both to the Arctic and the Antarctic. In addition to being vulnerable to increasing visitation, the polar areas are also markers for increasing climate change, which already is seriously affecting a large number of monuments and sites. In large areas of the Arctic, natural visitor impact was concentrated along the shores and bays where access was possible and overwintering relatively bearable. Warmer temperatures mean more annual freezing and thawing of the upper surface layers, disturbing the ground and thereafter structures in and on the ground. Less sea ice leads to more wave effects and coastal erosion, and climate changes will also affect the preservation advantages that many associate with polar areas – freeze drying and the absence of rot, bacteria and fungal growth. Herschel Island on the Canadian Arctic coast, as described in one of these articles, is just one example of the devastating effects that a warmer climate can bring to these areas.

A special aspect of the heritage of the polar areas, and one that has contributed to the forming of the IPHC, is the international background that is typical for these visitor cultures. Two of the final articles in this compendium treat aspects of the French sub-Antarctic Kerguelen Islands, where British, French, German and Norwegian heritage combine to form a source of historic information and conservation challenges for experts from the respective countries. Returning to the start of this introduction, where it is stated that the apparently remote and barren polar areas in fact contain a surprising amount of material evidence of earlier human occupations and activities, an article describes how archaeologists from Chile have been particularly involved in the last 20 years with an inventory of heritage sites in the chain of remote South Shetland Islands, off the tip of the Antarctic Peninsula. Finally the last article documents and explains some problems met by scattered historical sites in remote Arctic areas which have been exposed to various types of “collectors” throughout the years. Again these articles show what a variety of sites and historical connections there is to be found even in remote polar island environments.

Finally a mention must be made of the intangible aspects of polar heritage, which are mentioned in the article about the management plan for Mawson’s huts in Antarctica. Much of polar history concerns the extremes of nature, the devastating climate, the ice and snowy wastes, the isolation and calmness, the howling wind and driving snow. A hut displayed in a museum in a temperate town can give some idea of living conditions for polar pioneers, but the true situation can only be grasped out in the polar wilderness, where the simple minimal hut takes on a special meaning as the eye roams over the apparent vast emptiness, and the body feels the extreme environment in a both tangible and intangible sense. There are many important historical sites that in fact no longer exist for the naked eye, but which will forever exist in the mind’s eye of countless numbers who perhaps may never actually set foot in the areas themselves. The mythical North and South Poles are perhaps best kept in the mind’s eye and not experienced with today’s traffic. The tent where Scott and his two companions lie buried in eternity, is most probably never to be seen again, yet it remains evocative of the heroism and miscalculations of the Heroic Age of polar exploration. The tundra where trappers of many nationalities roamed with their skis and dogsleds to achieve a minimum of existence for the family back home is an open book into a unique lifestyle for those familiar with the diaries and literature of this culture. All, in fact, the stuff of countless novels and films throughout the decades !

This compendium could have been double and treble the size, with articles covering many more aspects of the complexity of polar heritage work. We hope that this sample gives an indication of the heritage wealth to be found also in these apparently inhospitable areas of the globe. For more information about the ICOMOS International Polar Heritage Committee see http://www.polarheritage.com

POLAR HERITAGE SITES AT RISK - POLITICS, PRINCIPLES AND PRACTICAL PROBLEMS

Paul Chaplin

Prior to moving from New Zealand to Norway, Paul Chaplin noted some of these issues in his role as Executive Officer of Antarctic Heritage Trust. In this paper he attempts to identify a few of the management issues, questions and discussions which often exercise the minds of those working to preserve polar heritage sites.

The polar regions of the Arctic and Antarctic were amongst the last places on the globe to be explored and exploited. Such relatively recent history means that the events associated with these discoveries have usually been well documented. We should therefore have a unique opportunity to protect and preserve the associated sites more effectively than has been possible with monuments and sites from earlier events in other parts of the world. Unfortunately however the difficult access and climate which kept these intriguing places secret for so long now conspire to make the task of conservation more difficult than in more populated regions.

Complex problems must be overcome by those who undertake preservation and protection of historic sites in higher latitudes. Many of these problems are linked to management and political issues as much as the technical aspects of conservation.

Politics

While many conservation issues apply equally in both the Arctic and in Antarctica, many others are unique to each region and one of the main differences emerges when political matters are considered. In both regions however the major issues are linked to the same basic question – *"whose responsibility is it ?"*

The Antarctic Treaty, which serves to protect the natural and other values of the continent, also disallows any territorial claims. This protection measure certainly avoids problems of sovereignty but unfortunately it also creates a situation where there is no clearly defined responsibility for the preservation and protection of historic sites. The Treaty system has produced a list of recognised historic sites (currently 76). The same system has also approved management plans for a few of the more significant sites, but to avoid the political sensitivities of sovereignty these plans have been carefully worded to avoid any suggestion of ownership by a particular nation. In effect this also means that no nation has any clear responsibility for preserving the sites, so it becomes all too easy for individual nations to ignore the increasingly obvious need for action. Conservation costs money and government funds are invariably limited, so any initiative to preserve historic sites is often left to non-government agencies which must find their own resources. This is often done with only token funding from government agencies while, ironically, government officials will often 'dine out' on the fact that they are actively supporting preservation efforts.

A related problem occurs because there is no clear definition of who is really authorised to take on such work, so there is often no clear mandate for those who ultimately undertake the conservation. In spite of this, however, a number of non-government agencies, such as the New Zealand based "Antarctic Heritage Trust", do undertake the responsibility to plan and undertake conservation - and do it well. This Trust does have international representation, but they remain exposed to criticism on the grounds that they have no formal mandate or right to intervene.

In the Arctic the sovereignty of the land on which a site is located is usually quite clear, but a problem can arise when the site itself has greater historical significance to a nation other than the one on which it stands.

In this case, who is responsible? Is it the nation on whose land the site stands or the country whose citizens' placed it there? This question can also be used to provide an escape for any nation which chooses not to take its heritage protection responsibility seriously.

Although questions of responsibility and mandates may appear to be rather academic, and in many respects they are, they can become impediments to conservation and lead to disputes or inaction.

The real problems however are usually of a more practical nature.

Access

Assuming that an agency intending to undertake conservation work has been able to secure the resources and approvals, the next problem to be faced is one of access and logistics.

In Antarctica, if not in the Arctic, logistic support for any fieldwork is almost entirely dependant on government agencies which invariably have conflicting demands on their limited resources. Access to remote areas demands costly air or sea transport and field support, so the cost of undertaking work in remote polar climates is always high. Conservation work periods are also limited to the relatively warmer summer months, and this means work that in other regions could continue all year round has severe time constraints when undertaken in polar regions.

Tourism

The adverse effects of tourism on historic sites is a matter for debate in all areas of the globe, but when the word 'tourism' is used in connection with polar heritage sites, many immediately have visions of red coated camera-carriers on a relentless rampage of destruction.

Tourist group at Scott's hut, Cape Evans. (Paul Chaplin)

Of course many historic polar sites do receive frequent visits from tourists, and there is some evidence of adverse impacts from excessive numbers of visitors. As a rule however the 'true tourist' visits as part of an organised group which is well briefed, well supervised and treats the sites with the respect they deserve.

A greater threat, however, often comes from smaller groups of independent visitors who are not generally regarded as tourists because they are on private expeditions. Other groups of this type are often those working on scientific or other projects in these remote areas and many of these are employed or supported by official government programmes. Such visitors do not have any malicious intentions, but they are often poorly briefed and informed about the significance and vulnerability of the sites. Codes of conduct observed by the 'real tourists' are often unknown or ignored by these casual visitors and some, because of their official status, may even have a sense of ownership which they believe justifies handling artefacts or even taking souvenirs. Fortunately some government agencies involved with such visits are now beginning to take action to remedy this problem, but sadly such visitors have been the cause of many losses in the past and the problem is not yet solved.

It is important, however, that benefits of tourism are not overlooked. These are the invisible benefits that are gained because tourists are so often overwhelmed by their experience that they become strong advocates for preservation and protection of the sites. Many former tourists also become a major source of funds for continuing conservation programmes.

Some well meaning individuals and heritage support groups, however, still believe that preserving the sites can be achieved by totally preventing human visitation – simply lock up the sites so no damage can be done. This may sound reasonable, but for two reasons it is not a solution. Contrary to popular belief, the sites are not at all permanently protected by the cold climate and the reality is that the majority of the sites are decaying as the result of natural forces. The other flaw in this logic is revealed when one asks, what's the point of locking them up so nobody can see them? Surely the point of preserving them at all is so that they can be accessible to educate, inspire and inform.

When it comes to visitation there must of course be a balance, but the challenge is to establish where this balance lies.

Conservation principles

As time goes by management plans are being prepared for an increasing number of polar sites, but in Antarctica the majority of early plans often focussed on environmental issues and codes of conduct for visitors. Without a doubt these are important aspects of any management plan, but regrettably in many cases these issues were dominant while specific conservation procedures, principles or responsibilities were often lacking. This deficiency is now being corrected in new conservation plans for major historic hut sites.

A number of challenging technical questions also exercise the minds of those working in this field. One key question arises when one attempts to apply the normal standards and ethics that guide conservation processes in less extreme environments. Conservation practices and standards have, in the main, emerged from experience gained in controlled institutional environments where it is possible to apply thoroughly tested procedures. These controlled conditions allow cautious techniques because there is time to assess and apply researched and proven processes. Insistence on such strict ethical principles is normally very wise, but difficulties can arise when such guidelines are enforced in polar environments. In polar conditions there are often no proven methods and to undertake prolonged research and testing can place artefacts in danger of loss due to inaction. In such situations, when historic material is already at risk, it could be wiser to have a suitably qualified and experienced conservator attempt an unproven process rather than lose the object to decay while debating academic, ethical and technical issues?

Replication

Is replication justified? (Paul Chaplin)

Another interesting debate surrounds the issue of replication of artefacts. If we accept that one valid reason for preserving our historic sites is to educate and inspire present and future generations, then is it legitimate to enhance the experience of a visitor with controlled use of replicated artefacts? Is such replication justified when it allows a genuine artefact to be replaced and removed for protection in a controlled environment?

Some claim that replication sacrifices authenticity for the sake of the tourist, but could controlled replication be considered a legitimate conservation tool if the change is properly documented and serves to protect a genuine artefact while enhancing the visitor experience? Should our cultural heritage be saved for all to experience or should it be protected only for the benefit of those in the conservation business?

Relics or rubbish?

When does an artefact become rubbish? Around many historic polar sites there are food supplies and equipment which are at an advanced stage of

Canned food supplies outside Shackleton's hut, Cape Royds. (Kirsti K. Paulsen)

decay, with some objects at the point where they are barely recognisable. Others have been scattered by wind, and this leads to a frequent debate about the point at which these items cease to be artefacts and become rubbish – or even worse, create an environmental problem.

Other questions apply to places that have been used as rubbish dumps by the original inhabitants. Like historic sites in other regions such rubbish dumps can yield valuable archaeological information.

So when does an artefact become rubbish, or rubbish become an artefact? Good definitions for such situations are critical. This problem is treated in more depth in a later article in this compendium.

Level of intervention

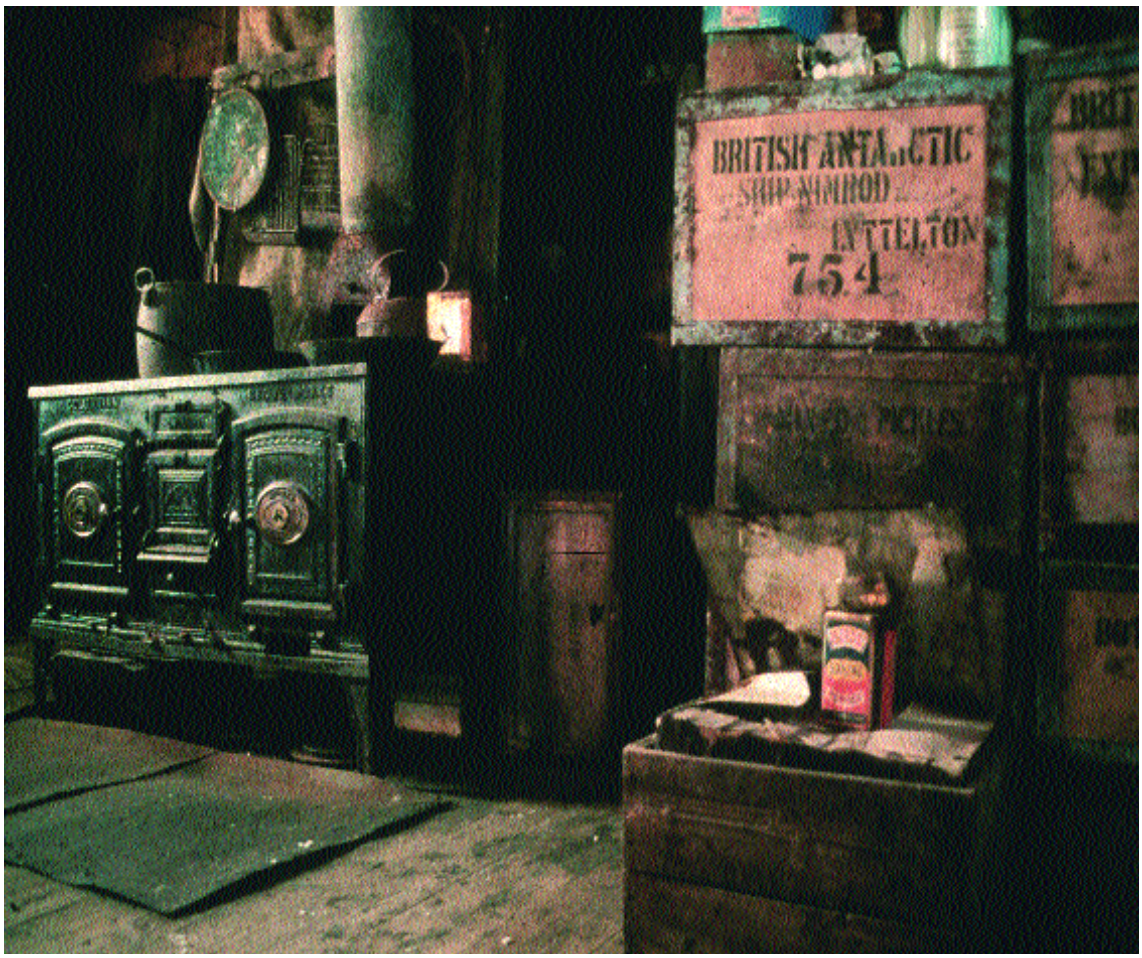
A further dilemma arises with questions concerning the stage in the history of a site at which it should be maintained. As far as expedition huts are concerned the most significant historic events associated with them are often linked to the original users. Since being abandoned by these first users others have sometimes occupied them and these more recent users have in many cases modified them so that some of the original characteristics have been lost. Is it then correct to try to return them to their original form?
What does it take before subsequent changes become historically significant and worthy of preservation?

These questions generally come down to one point - should a site be restored to the state in which it was used by its original occupants or preserved in its current state protecting the characteristics of subsequent use? Circumstances vary from site to site so it is not surprising opinions on this subject are usually far from unanimous.

Conflicts with environmental and wilderness values

There is no doubt that wilderness and environmental values world-wide now have a much higher priority than they had 20 years ago. When much of the early polar exploration was being undertaken a century ago there was little attention paid to such principles and as a result the bases and other structures associated with early exploration were purely functional as far as design, location and use were concerned. Naturally enough they were also located in areas which gave good access by sea and good routes into the hinterland.

For the same reasons these areas now capture the attention of advocates for environmental and wilderness protection. Justifiably perhaps these groups believe that the unique wilderness and natural beauty of polar areas is adversely affected by historic remains, and such claims are increasingly heard as a reason for removing or relocating some early bases. Wilderness and environmental values are therefore becoming major factors in management plans. In most cases it should be possible to establish a reasonable balance



Shackleton's 1907-09 hut at Cape Royds contains many valuable artefacts and challenges for those who must conserve them. (Ed Anderson)

between historic and wilderness values, but there is increasing pressure to subordinate historic values in favour of aesthetic and environmental considerations.

The role of the IPHC

All these issues, like so many other aspects of polar heritage protection, have in the past been addressed in a rather fragmented way with little international collaboration. It was partly in response to such ad hoc developments that the International Polar Heritage Committee (IPHC) was established in November 2000. The IPHC acts as a scientific sub-committee of ICOMOS with the aim of providing a co-ordinated approach to polar heritage protection. It aims to offer an international resource of expertise, information and advice to all who work in this field.

The committee is made up of representatives appointed by the National ICOMOS committees from countries with an active polar interest. Corresponding and Associate members can also be nominated. At the time of writing there were 14 members appointed as national representatives with 4 additional corresponding members and a number of prospective associate members. A number of other countries are in the process of appointing national representatives.

The IPHC is now undertaking a number of projects to meet its objectives and to make itself known as a resource for those working in the field of polar heritage protection.

DETERIORATION OF ANTARCTIC HISTORIC SITES – EFFECTS OF ANTARCTIC CLIMATES ON MATERIALS AND IMPLICATIONS FOR PRESERVATION

Janet Hughes

The extreme and unfamiliar characteristics of the Antarctic climate

While most people would expect that the severe Antarctic climate poses threats to historic buildings, the effects of the cold and windy climate are often poorly understood, and are rarely reported in a comprehensive and detailed manner. This has created debate about the causes of problems, the rates at which damage and deterioration are occurring and what conservation treatment is appropriate.

Preservation of historic sites is not considered an issue for the international Scientific Council on Antarctic Research, although there are several important scientific challenges and potential benefits from research on deterioration and preservation of historic materials in Antarctic conditions. Research on materials performance and deterioration processes in cold climates has been researched in the Arctic, but this has not been comprehensive and concentrates on modern materials and industrial problems relating to petroleum production and permafrost movement affecting construction. Excellent on-line bibliographies exist at http://www.coldregions.org. Some problems in the Arctic are similar to those in Antarctica but there are significant differences in historic, climate and geographical contexts to be considered.

Fundamental cold climate problems such as corrosion, effects of repeated freeze-thaw cycles and damage of wood and plastics by crystal growth and the combined effects of several deterioration processes occurring simultaneously have not been adequately studied (Hughes 2000). Standardised rate measurements of deterioration processes are scarce. This information is important in predicting service life of components and structures in unfamiliar and extreme conditions. This would benefit contemporary construction by identifying durable materials and appropriate design details to avert problems and increase service life, thereby reducing environmental impacts.

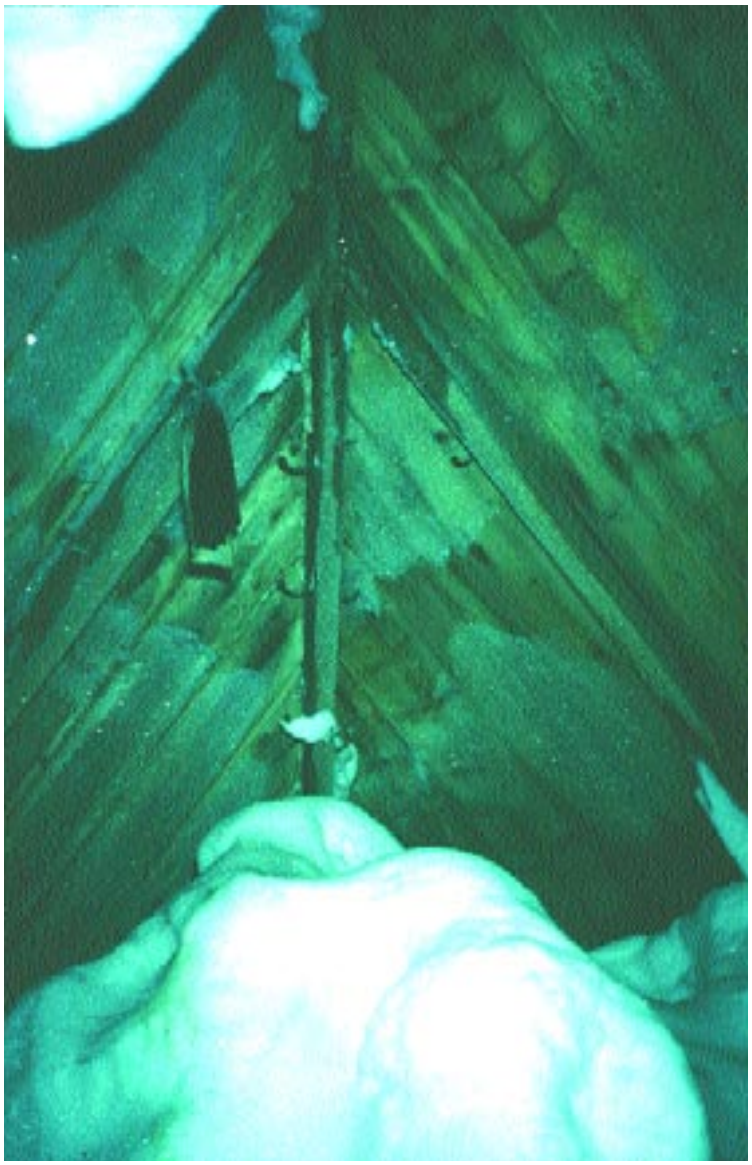
Historic sites are the places where the first human impacts occurred on the Antarctic environment, and studies of deterioration of historic materials can provide valuable information on the persistence of these materials and their decomposition products. Growth of organisms on historically dateable materials can be useful in providing long-term biological growth rate where few documented site measurements exist. There are many opportunities for heritage professionals to collaborate with diverse scientists to identify scientific resources of historic sites.

Surveys of historic buildings throughout Antarctica reveal diverse deterioration problems including structural damage by wind; erosion of surfaces by windborne ice or sand ('corrasion'); defibring of timber by salts; fungal and algal growth affecting organic materials such as timber, paper and textiles; fading and photo degradation by high ultraviolet radiation; and a range of problems due to inundation by meltwater.

Effects of low temperatures on materials

The notorious Antarctic cold produces extraordinary preservation of some organic material such as the ham in Shackleton's hut at Cape Royds dating from 1907. However, temperatures are not universally nor constantly cold, and localised warming (microclimates) can cause considerable damage, especially if meltwater is formed. In polar conditions, air and surface temperatures can often differ markedly due to long hours of summer sunshine, but this may not be considered unless surface temperatures are measured. The low sun angle in polar regions causes greater photo degradation of vertical surfaces than horizontal surfaces. Many materials darken as they age, increasing the extent and severity of these problems, particularly affecting photo degraded timber and corroded metals.

Low temperatures can cause embrittlement of metals and some plastics leading to structural failure. Risk data is available for new materials exposed at low temperatures, but is generally not available for aged



Hoarfrost sublimation on the interior of Mawson's Hut. (Janet Hughes)

materials exposed in field conditions where several deterioration factors may occur simultaneously. The structural disintegration and powdering of tin due to cold exposure ('tin pest') is no longer considered to occur except in high purity tin, which is rarely found in historic artefacts.

Monitoring of relative humidity (RH) in Antarctic buildings can be difficult and expensive but is vital since RH fundamentally affects most deterioration processes. RH sensors can give false readings if localised condensation freezes on the sensor surface, since this is unrepresentative of ambient conditions. Localised sublimation must also be considered. Temperature and RH monitoring has been undertaken at Scott's Cape Evans hut (Mason 1999) and at Mawson's main hut at Cape Denison (Ganther et al 2002) and is being used to assess impacts of building treatments.

'Freeze-thaw' damage is frequently and inaccurately cited as the cause of damage to wood, and was even alleged to affect materials which cannot freeze. Some problems are due to differential expansion/contraction rates of materials and others are due to growth of salt crystals which break cellulose fibres in timber ('defibring'). Large and rapid changes of temperature and humidity should be avoided in buildings wherever possible to reduce deterioration rates. Monitoring and condition surveys should be used to quantify the extent of deterioration problems before conservation is undertaken and to monitor whether conservation treatments are effective.

Corrosion

Despite common expectations, low temperatures do not prevent corrosion in Antarctica, although in inland Antarctica corrosion rates are low due to the combined effect of extreme cold and low levels of salts and pollutants (Hughes, King and O'Brien 1996). Most historic and current human activity occurs in coastal locations where salt deposition is high, and the absence of rain means salts remain on the surface for extensive periods. Corrosion rates in the Antarctic Peninsula are very high and coastal sites in the colder parts of Antarctica such as Ross Island experience rates comparable to suburban areas in temperate Australia. Many artefacts and crucial building components (such as bolts, nails, ridge capping) at historic sites are significantly corroded.

Canned foods are important historic artefacts in the Scott and Shackleton huts in the Ross Dependency. Canned food is difficult to treat even in a museum laboratory, since any paper labels must be separated from the lacquered can to treat corrosion, and decaying food corrodes the metal interior. There are few successful chemical treatments for corroded plated metals since the electrochemical conditions required to stabilise the different metals are often incompatible, since treatment of the tin can accelerate corrosion of the underlying steel. The large quantities of cans at some sites and difficulties of carrying out chemical treatments

in the sensitive Antarctic environment limit the numbers that can be treated. Transportation of artefacts is problematic for many sites. Mass treatment methods would require extensive development to be effective on return to the high RH conditions and salt exposure occurring in most historic Antarctic buildings.

Corrasion – erosion of surfaces by windborne particles

Corrasion damage at Cape Denison has often been grossly over-estimated using the height of nails to measure erosion loss. Battens were originally nailed over various parts of the exterior cladding that have been progressively blown off by the wind. Most of the cladding has been eroded about 2mm in 75 years but is greater where ridges and corners project into the boundary layer flow of particles carried by the katabatic winds. Measurements of corrasion of Borchgrevink's hut at Cape Adare by Harrowfield (1985) have documented significant erosion due to beach sands impinging on the interlocking log construction.

The movement of sand and snow by the wind is practically impossible to prevent and wind deflector barriers may cause increased loads on weakened structures. Proposals such as covering buildings with clear perspex geodesic domes ignore the durability problems of clear plastics (which become opaque and degrade with high UV light and corrasion) and difficulties in sealing out small particles in high winds. Such enclosure of buildings traps moisture and can increase temperature and RH fluctuations increasing deterioration. These proposals pose clear risks, are expensive and visually inappropriate.

Accurate measurements of corrasion rate combined with realistic risk assessments are required to seek alternative mitigation measures which may include encouraging snow drifts to form in areas where they protect surfaces, and removable 'sacrificial' coverings appropriate to historic and aesthetic contexts.

Wildlife and human impacts

Wildlife can disturb artefacts by nest building and wallowing. Penguin guano accumulation around buildings at Cape Adare causes nutrient-rich meltwater to flow inside buildings, exacerbating biodeterioration. Most historic sites cannot be effectively fenced off from wildlife as fences encourage accumulation of snow or sand and vegetation enabling wildlife to climb over. Wire fences risk entanglement of animals, which is unacceptable. At some sites, artefacts are hazardous to wildlife, including abandoned oil and chemicals at recent sites, and barrels at Cape Adare which can entrap penguins. Risk assessments for both wildlife and historic resources must be realistic and artefacts causing hazards should be removed if there is no feasible alleviation method.

Human impacts (trampling, disturbance or loss of artefacts) are of concern due to increasing visitor numbers. Some historic sites in the Antarctic Peninsula are the most visited sites in Antarctica, yet few tourism researchers are monitoring impacts on historic sites in their studies. The International Association of Antarctic Tour Operators (IAATO) makes strong efforts to prevent visitors touching or damaging historic sites, however

Tourists visiting Shackleton's hut at Cape Royds. (Kirsti K. Paulsen)

INTERNATIONAL COUNCIL ON MONUMENTS AND SITES
CONSEIL INTERNATIONAL DES MONUMENTS ET DES SITES
CONSEJO INTERNACIONAL DE MONUMENTOS Y SITIOS
МЕЖДУНАРОДНЫЙ СОВЕТ ПО ВОПРОСАМ ПАМЯТНИКОВ И ДОСТОПРИМЕЧАТЕЛЬНЫХ МЕСТ

Polar settlements – location, techniques and conservation

This publication is compiled and edited for
the International Polar Heritage Committee of ICOMOS by :
SUSAN BARR – President IPHC
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most guides only control visitors inside buildings with little supervision of those walking around the site where artefacts are at risk. Visual encroachment by neighbouring contemporary stations is a problem at sites such as Robert Scott's Hut Point where the large US station of McMurdo dwarfs the small historic building.

Site management

Conservation Management Plans have been accepted by Antarctic Treaty nations for some of the earliest and most important sites. These plans incorporate limits on visitor numbers and protective measures including prohibitions on removal of artefacts. However, much improvement could be produced by greater international cooperation to standardise conservation assessment processes, collate deterioration rate methodologies and data and by exchanging information on development of conservation treatments.

Ice accumulation inside and around buildings at Wilkes. (Rupert Summerson)

Conclusions

It is vital to conduct site surveys appropriate to Antarctic conditions and to resolve controversial issues such as whether the accumulation of ice inside buildings (e.g. at Cape Denison or at Wilkes) is causing damage or is protective. Studies of material deterioration affecting Antarctic historic sites must be conducted before carrying out treatment of these rare and precious places, otherwise repair materials may fail, or the treatments could prove inappropriate and cause more damage and waste of scarce resources. Improved conservation practices for polar historic sites and greater communication between heritage professionals working in the polar regions will help to ensure that future generations can be inspired by these special places.

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SCIENTIFIC EVALUATION OF DETERIORATION IN HISTORIC HUTS OF ROSS ISLAND, ANTARCTICA

Roberta L. Farrell, Robert A. Blanchette, Margaret Auger, Shona M. Duncan,
Benjamin W. Held, Joel A. Jurgens, Ryuji Minasaki

Introduction

The British National Antarctic Expedition (1901-04) led by Robert F. Scott built a large wooden building at Hut Point on Ross Island, Antarctica, commonly referred to as *Discovery* Hut, to shelter and store supplies for 48 men for 3 years during their explorations of the South Polar Region. The British Antarctic Expedition led by Ernest Shackleton followed in 1907 and another hut was built on Ross Island at Cape Royds to house a shore party of 15 men. Scott returned in 1910 on the ill-fated *Terra Nova* British Antarctic Expedition. This 25-person expedition erected a large prefabricated hut at Cape Evans to provide accommodation and also built a smaller structure that was framed in wood and lined with asbestos sheeting for taking magnetic observations. *Discovery* Hut was used extensively by the latter expeditions in the Heroic Era as a key stepping stone to the southern latitudes and a shelter for those who returned from the south. Although all three expeditions had primary goals to discover new land and be first at the South Pole, they also had important scientific objectives. Each of the expeditions had one or more biologist, geologist, meteorologist and physicist to carry out the scientific programs. When the expeditions ended and relief ships arrived, a rapid exodus allowed only essential items to be returned to England. The huts and thousands of items were left behind, including food stores and fuel depots with unused containers of petroleum products, asbestos materials, and diverse chemicals.

A joint scientific collaboration began in 1997 between The University of Waikato in New Zealand and the University of Minnesota in the United States of America to evaluate the deterioration of the Ross Island historic huts and artifacts and their environs. The key to the collaboration has been to use state-of-the-art multi-disciplinary scientific methodology. Specifically, for the first time in the Antarctic, microbiology, wood chemistry, biochemistry, and molecular biology have been applied to the study of the deterioration, while the scientists have also worked with Antarctic Heritage Trust and conservation architects who are developing conservation plans for the Ross Dependency Historic areas. The four major goals of the collaboration are as follows:

1. Identify cause of non-biological & biological deterioration present in Historic Huts & artifacts.
2. Characterise environmental pollutants in the historic areas left behind from the 'Heroic Era' of exploration.
3. Test conservationally-acceptable materials for long-term preservation.
4. Investigate biodiversity in the Historic Hut areas, especially fungi and bacteria.

The collaboration has also determined the wood species used for the construction of the huts and various wooden artifacts found at the historic sites.[1] Identifications were made by taking small sections of wood from the structures and associated artifacts and examining them with light microscopy for anatomical characteristics, according to standard protocols. [2] This information is essential for conservation efforts if any of the deteriorated woods need to be replaced.

The Ross Island historic huts and surrounding areas attract many tourists as well as scientists and visitors from nearby McMurdo and Scott Bases and are therefore the most affected by decades of human activities of any Antarctic historic areas. Standards that guide research and conservation work conducted at the historic sites include those derived from the *Antarctic Treaty* (1959), and the Protocol on Environmental Protection to the *Antarctic Treaty*, known as the Madrid Protocol (adopted 1991) which provides, in Annex V, for the preservation and protection of historic sites as Specially Protected Areas or Specially Managed Areas. The Antarctica (Environmental Protection) Act of 1994 (the Antarctica Act) is the New Zealand legislation implementing The Protocol and under which all activities concerning the Ross Island historic huts pertain.
The Antarctic Heritage Trust (AHT) is a charitable trust formed in New Zealand in 1987 to conserve the historic

sites of the Ross Sea region of Antarctica. The joint scientific collaborative research results, an overview of which is reported in this paper, are directly contributing to the fulfilment of the work of AHT by demonstrating scientifically the state of the huts and environs.

Non-biological deterioration

Non-biological degradation processes can severely affect the physical and chemical structure of wood[3]. Morphological examination of minute wood samples, including light microscopy, scanning electron microscopy, and transmission electron microscopy are used by the Universities of Minnesota and Waikato collaboration to characterize decay patterns present. Chemical analyses for lignin, carbohydrates, extractives, etc. are difficult to carry out using very small samples, but minute samples are used with histological stains for light microscopy and electron dense stains for electron microscopy to identify and monitor the removal of cell wall components in deteriorated samples. Elemental analysis of wood is carried out by using multi-elemental inductively coupled plasma atomic emission spectroscopy.[3 a,b,c] These techniques have been very successful in other studies using small samples of archaeological woods to ascertain the type of degradation present and reveal important information on the current condition of the wood, extent of cell wall degradation and zones with the greatest structural losses[3 a].

Ultraviolet (UV) light, iron corrosion products, salts and other caustic compounds cause a deterioration that progresses from wood surfaces to inner regions of the wood. UV light may cause a selective attack of lignin and hemicellulose resulting in a defibration of the wood. Over time a gradual loss of the outer wood cells takes place and the surface gradually erodes away. Salt accumulations in wood cause chemical erosion of the lignified middle lamella and alterations to cellulose within the secondary walls. This chemical attack has only recently been described and the conditions for its occurrence elucidated.[4] Damage may occur quickly where large concentrations of salt are in contact with moist wood or very slowly as low concentrations of salt accumulate in wood after evaporation. Figure 1a illustrates cell damage of a sample of wood from the exterior wall of the Cape Royds Hut showing extensive disruption of wood tracheids. Cells have separated at the middle lamella region and appear defibrated. The secondary walls of latewood regions are intact, but the wood has little structural integrity left. The diffuse nature of the damage throughout the wood, lack of fungal mycelia and selective attack on the lignified middle lamellae suggest that deterioration of the surface layers of the wood is the result of salt attack. Although the exact process of salt deterioration in wood is not fully understood, it is apparent that the high salt concentrations cause a chemical reaction to take place in which the hemicellulose and lignin in the middle lamella is degraded.[4] This is exhibited in affected woods by a defibration of surface fibers, giving the wood surface a fuzzy appearance that can be seen in Figure 1b. There are many locations at all three huts that are affected by salt deterioration. All of these locations involve moisture absorption from melt water in pools on the ground, or by the melting of snow from the roofs directly on the huts or artifacts.[4]

Fig. 1a Scanning electron micrograph of a transverse section of wood showing a loss of middle lamella and a separation of cells.

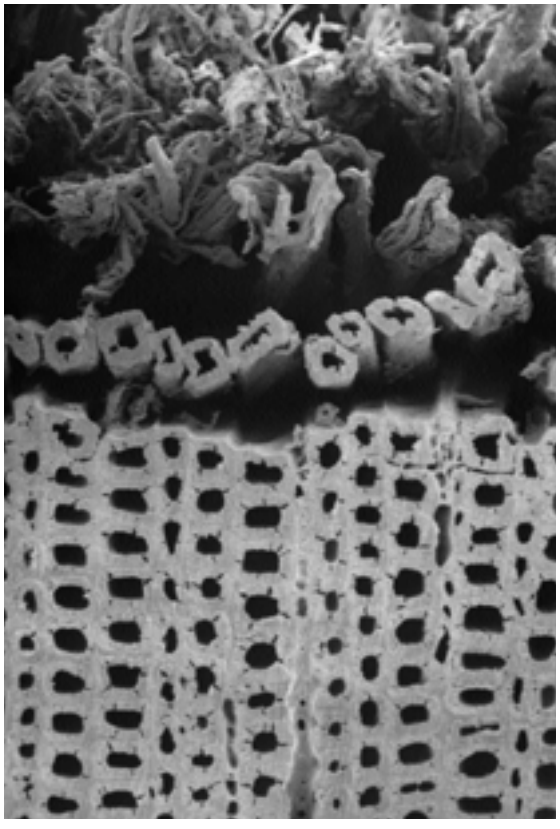
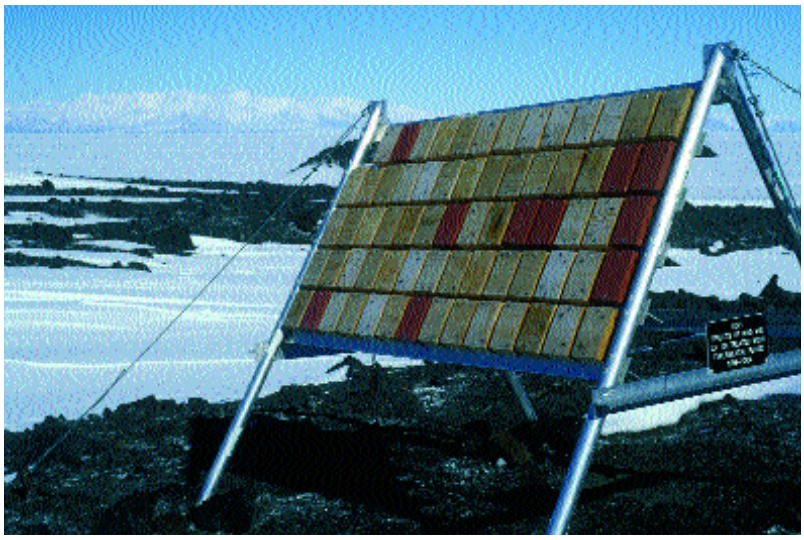


Fig. 1b Non-biological deterioration from Cape Evans hut. Chemical deterioration causing a defibration of wood. As snow melts, large amounts of the wood fibers are removed and the historic wood is gradually destroyed.



Test panel erected in January 2000 at Cape Evans. Similar test panels also erected at Cape Royds and Hut Point.

Wind erosion can be identified in many locations of the huts and associated artifacts.[5] High velocity winds originating from the South Pole carry airborne ice and scoria particles that cause a sand blasting effect on the exposed wood. Therefore most of the significantly eroded areas are those that face south. By using digital videography over the past six years the collaboration has documented that the exterior wood is not eroded uniformly by wind. Windborne particles erode the highly lignified, thick-walled latewood cells at a slower rate than the thin-walled earlywood cells, leaving affected wood with an uneven, furrowed appearance.

Three test panels, one at each hut location, were established to test possible treatments for use on the huts. Blocks of wood were treated, fixed to the panels, and maintained on the panels or removed for examination and study in laboratories. New treatments and wood combinations can be subsequently fixed to the panel. For initial consideration, in Austral Summer 2000, blocks of pine and spruce were treated with four silicon-based treatments and an oil based paint similar to the type that was originally used on *Discovery* Hut, and fixed to the panels. These wood blocks have been assessed and significant erosion has been shown to take place after only two years of exposure. These treated wood blocks are being monitored for the next 5-8 years.

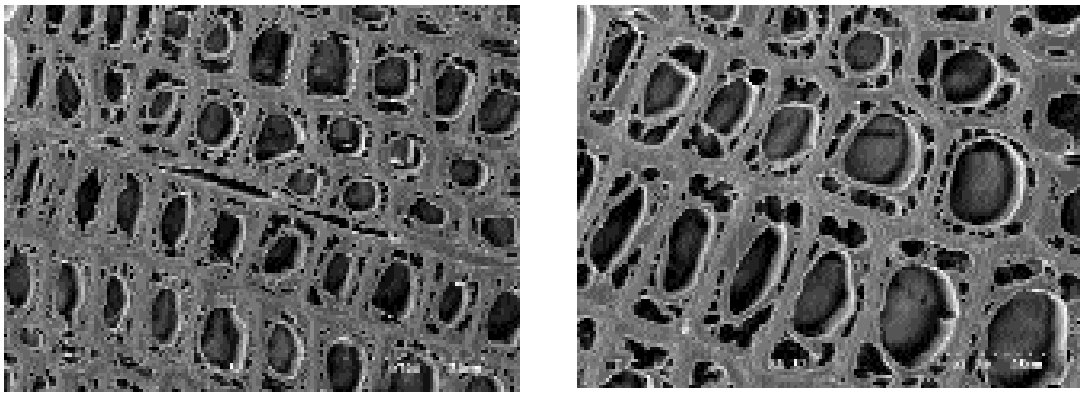
Biological deterioration and biodiversity in the Historic Huts

Biological degradation of wood and other organic matter is common in the huts. Actively growing fungi have been observed and isolated from walls, floors, ceilings and beams, clothing, leather, wood, foodstuffs and other artifacts within the huts. Previous investigations of mycoflora in the historic areas on Ross Island, Antarctica focused on long-term survival of microorganisms. Meyer, et al. (1962)[6] demonstrated the viability of filamentous micro-fungi from a sealed bottle of yeast from Cape Evans hut. They also isolated *Mucor* sp. from tinned barley from Shackleton's hut at Cape Royds and *Penicillium* sp., and unidentified dematiaceous fungi from hay at Cape Evans.[7]

The Universities of Waikato and Minnesota joint collaboration has isolated and identified wood decaying microorganisms present in the Historic Huts and environs, and addressed the general biodiversity of microorganisms present.[8] Sample collection was initiated by identifying affected wood, artifacts, soil, ice, debris etc. and placing small segments of these in sterile vials on site. Permits have been granted by the Ministry of Agriculture and Forestry, New Zealand to bring samples out of Antarctica. These samples are cultured in the Universities' laboratories on a wide variety of growth media, at various temperatures, typically in the range of 0 to 25 degrees Centigrade, for isolation of fungi and/or bacteria, or studied by molecular techniques. Pure cultures of fungi have been obtained and identified using various taxonomic keys from the mycological literature and/or molecular probes; examples of some of these from Cape Evans historic site are given in Table 1.[9] Cellulases, enzymes that catalyse the degradation of cellulose in fibers, such as wood and/or cotton textiles, have been isolated from several of these organisms and are now being characterised as to their role in the decay of wood at temperatures experienced within the huts. Environmental data loggers were placed by the joint collaboration at various locations and at varying heights with six dataloggers in each hut. The data is currently being processed to give both macro and microclimate information and has revealed that during the austral summer, temperatures rise above freezing and relative humidity within the structures is often well over 80% providing conditions conducive to microorganism growth and enzymatic activity.[1]

Filamentous micro-fungal diversity was also identified from the historic materials at *Discovery* Hut at Hut Point.[10] There were 22 taxa and 14 genera recorded from this study. Many cosmopolitan genera were isolated from the samples collected inside *Discovery* Hut. *Penicillium* species were most frequently isolated. Isolations made from straw samples contained a variety of other fungi. Visible fungal colonies on the wall and floor also contained many filamentous micro-fungi which were not found in the other samples.

An unusual wood destroying fungus is causing decay in the historic woods that are in contact with the ground.[11] Micromorphological examinations indicate just one type of decay, a soft-rot, is present in all of



Scanning electron micrographs of transverse sections of historic wood from Cape Royds hut showing attack of the secondary wall layers by soft-rot fungi. The fungus penetrates the secondary cell wall and causes large cavities that coalesce causing significant damage.

the deteriorated woods. The fungus grows into the wood cells, forming elongated cavities within the secondary wall layers. Soft rot fungi were isolated from all three of the historic huts in the Ross Sea region, but were found most prevalent in wood from Shackleton's Cape Royds hut. Pure cultures obtained from the historic woods were identified by morphological characteristics and phylogenetic analysis. Investigations of microbes in Antarctic soils and moss[12/13] revealed that *C. malorum* and other *Phialophora*-like fungi are present at many different locations, suggesting these fungi are endemic to Antarctica. Although it has been millions of years since trees grew on the Antarctic continent, fungi there have retained their degradative enzymes to attack wood when it is in contact with soil. A previous report has shown the presence of *Phialophora*-like species in preservative treated wood and indicated their tolerance for high concentrations of copper, arsenic and other toxic compounds.[14] A better understanding of what allows these organisms to live where others are inhibited is needed[15], and more information on the biochemistry of degradation is needed. New knowledge of these polar fungi is needed if we are going to find effective controls that can be used to preserve the huts long into the future. These microbes living at earth's most extreme environments will undoubtedly be a formidable challenge to control. Little is known about the mechanisms in which filamentous fungi can survive numerous freeze-thaw cycles[16] and how introduced organisms can adapt in the Antarctic climate regime.[17] Successful conservation of the huts requires an understanding of these mechanisms and the biology and ecology of these decay organisms so degradation processes can be controlled.

Another remnant of the Heroic Era on Ross Island is the extensive stores of seeds outside the huts, particularly at Cape Evans and Cape Royds. Concerns have been raised about the impact on the antarctic environment and fauna of both the seeds and micro-organisms proliferating on them – fungi and bacteria are actively growing on the seeds and have been identified. Alas for historic interests the seeds have not been able to be germinated.

General environment of the Historic Huts and environs

The environment of the Historic Huts is also being scientifically studied.[1] There are many chemicals in various unlabelled bottles, containers and in glass tubes or other scientific apparatus left within the huts that should be evaluated to ascertain their identity. The high relative humidity found within the huts has promoted mold growth on paper, textiles and even wood. These organisms have contributed to the poor condition of many of the labels. Chemical spills may also still occur by freeze-thawing of liquids and subsequent glass breakage or by inadvertent accidents from curious tourists who visit the huts, or even conservation and research activities within the huts. An historic chemical spill within the Cape Evans hut, apparently from caustic substances from one of the scientific experiments, has caused an unusual deterioration and defibration on affected woods. This deteriorated wood is similar to degraded wood found in the historic laboratory of Thomas Edison that was

affected by a similar type of chemical spill[18]. The chemicals caused a slow degradation of wood and the process continued unchecked since the laboratory is a protected historic building. In the Antarctic, the chemicals absorbed by the wood have had many decades to corrode and alter the cellular structure, resulting in the current condition of the wood.

Decaying stores around the hut are degrading the environment, and under current environmental protocols for Antarctica intervention to prevent further pollution is imperative. Fuel depots with unused containers of petroleum products, asbestos materials, and diverse chemicals were also left at the huts. The joint collaboration found high concentrations of polyaromatic hydrocarbons in soils under and around the historic fuel depots. Asbestos materials within the huts have been identified and extensive amounts of fragmented asbestos were found littering the ground around the Cape Evans hut. Within a relatively small area immediately adjacent to the hut, several hundred fragments of asbestos-containing materials are located on the ground surface. These materials are continually abraded and fragmented as tourists walk over them and the coarse scoria breaks and grinds down the materials. Wood and soil samples containing lead and other heavy metals have also been identified at the huts. Although these areas are important historic sites protected by international treaties, the hazardous waste materials left by the early explorers should be removed and remedial action has been proposed to restore the site to as pristine a condition as possible.

Acknowledgements

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Table 1. Isolation of fungi from Cape Evans hut and artifacts

Fungal Genus Species	Origin of wood sample
Cladosporium sphaerospermum	Wall behind table, Wall under bed Wood near floor on south wall NE corner post
Geomyces pannorum	NE corner post Damp spot on interior wall south side Table cloth
Myceliophthora	Damp spot south wall Inside Door step Wall behind Mutton
Penicillium chrysogenum	Floor at base of south wall
Penicillium spinulosum	Dark Room Wall
Penicillium verrucosum	Wall near floor south side
Cadophora malorum	Damp spot south wall
	Wall behind table Interior wood

ARTEFACT OR RUBBISH —
A DILEMMA FOR ANTARCTIC MANAGERS

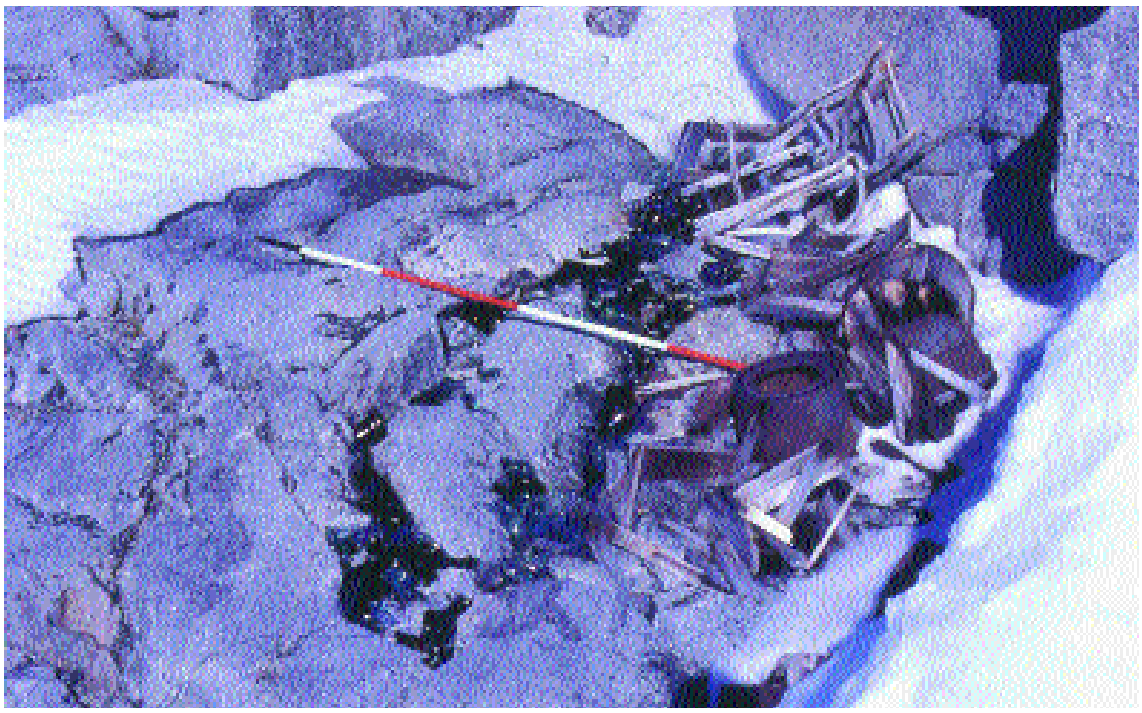
Michael Pearson

What is artefact and what is rubbish?

Deciding what constitutes 'cultural heritage' in the polar regions is sometimes difficult. Most people would accept that, say, the surviving huts of the Heroic Era Antarctic explorers Scott, Shackleton, Nordenskjöld, Borchgrevink and Mawson were of cultural heritage significance. Most would also agree that personal items located in the huts, such as clothing, books, equipment, sledges and pony harness known to have been used by the exploration parties, were historically important. But what about the packing cases, food containers, old clothes, biological samples, and broken equipment surrounding Mawson's Hut at Commonwealth Bay, or located in collapsing caches at Shackleton's Cape Royds hut? Individual objects of historical interest are usually called 'artefacts' and are considered worthy of protection, whereas the broken, rusty or rotten are usually regarded as 'rubbish', and are likely to be disposed of.

However, the 'rubbish' can have major historical and research significance. It contains clues about the more prosaic and mundane aspects of survival in the polar environment, the things that do not always make their way into the official lists and records of the expeditions. Some examples from Mawson's hut illustrate the point. Some 'rubbish' can show how the occupants of a site made use of what was available to them to solve problems not envisaged when they packed their ships to leave home. Examples would include the lamp, made out of an old tin can, used to mark a reference point needed for magnetic observations during the long winter's night at Mawson's hut, and the strips of metal, canvas sail and insulation material used to seal the joints between the rough boards to reduce the sifting of snow into the hut. Some items that might appear to be rubbish can be something else entirely, such as the jumble of wires and long post sections that are the remains of the aerial set up to make possible the first radio transmissions from the Antarctic continent. And then there are the carcasses of seals and penguins, killed and stored to provide emergency food

Abandoned material around Mawson's hut, Commonwealth Bay. (Mike Pearson)



Artefacts or rubbish? (Mike Pearson)

supplies, which have the potential to provide chemical analysis of the atmospheric and environmental conditions of 1911.

Obviously, not all the rubbish around an old site will have the same potential to provide historical evidence or clues about the life of those occupying the site, but uncontrolled clean up of sites invariably destroys any potential that might have existed to study and, if appropriate, conserve this sort of evidence. There is also a case to be made that the cultural landscape of Antarctic exploration huts invariably included piles of packing cases, building materials and stores surrounding the huts. To remove the rubbish altogether is to sanitise and falsify the historical picture.

The problem of the management of artefacts / rubbish is confounded as the sites become more recent. Deciding when a place begins to have heritage value is a common problem faced by the managers of sites less than about 50 years old. There is no cut-off-date for heritage—it all depends on the particular historical or scientific associations of the particular place. If, for example, the activities represented at a site have been superseded by new technology, they are likely to have some degree of historical significance. Some people, but not all, would think of the surviving components of the 1950s International Geophysical Year (IGY) stations (such as Wilkes Station) as having at least some heritage significance, because the technology of the 1950s stations is now outmoded, and the lifestyle experienced there will never be repeated. But most people would not think of the mountains of empty 44-gallon drums, vehicle bodies and gas cylinders associated with recent sites as being heritage. Where, then, is the distinction between 'artefact' and 'rubbish' drawn? And how should managers of these places respond?

In a strictly archaeological sense, all cultural material including rubbish, is 'artefact'. That is, it is evidence of human activity. But even archaeologists do not give all artefacts the same degree of importance. The greater the capacity of the artefact to tell stories or add to the weight of important evidence about human activity, the more likely it is to be studied and conserved. When associated with an historic site, all artefacts are usually recorded in some way, but not all are necessarily kept. Very recent material, or material that is represented by hundreds of examples at the site, or contain hazardous chemicals, may sometimes be sampled for analysis, while the bulk of it may be removed.

In Antarctic historic site management there has been a long genesis of thinking about artefacts. Before the Ross Sea huts of Scott and Shackleton were first conserved in the 1960s, much 'cleaning up' of the areas surrounding the huts was undertaken, and lots of material related to the historical occupation of the sites was burnt or tipped down the tide crack at the sea's edge. The report of the initial clean up of Scott's hut at Cape Evans by men of the HMNZ *Endeavour* in 1958 describes leaving the hut and surrounds 'in a neat and tidy appearance' with 'the surrounds of unsightly rubbish considerably reduced'. At Shackleton's Cape Royds

hut 'heaps of surrounding rubbish were tackled for a clean up'.[1] Broken household goods, machinery parts, parts of collapsed buildings, glass and metal food containers and other assorted things were regarded as rubbish, and dealt with accordingly. This was standard practice of the day. Where artefacts were concentrated, such as at the several caches laid out around the main hut to provide sanctuary in case of fire, they were 'tidied up' but generally left as recognised parts of the historic site. Artefacts distributed by wind or animal agency did not fare as well.

A result of the early 'clean-up' practices is that most of the Heroic Era huts have lost much of their surrounding artefact collections. This evidence would have been greatly valued by archaeologists, architects and materials conservators working on the conservation of the huts today. Mawson's Huts (1911-13), on the other hand, have retained the bulk of the artefact material that was taken to the site during its period of occupation, except for those high-value items taken home to help defray the costs of the expedition. This is because the site is isolated from areas of subsequent research activity, and has not been much visited nor subject to substantial conservation programs until more recent times. While the plume of artefacts down wind of the hut may be considered by some to be unsightly, few would now argue that it should be removed as rubbish.

At Wilkes Station, a 1957 United States IGY station taken over by Australia in 1959 and occupied until Casey Station was completed in 1969, the abandoned buildings are largely intact within a deep snow drift. Around the site are various piles of stores and materials associated with the occupation of the place, including collapsing Jamesway huts full of canned and boxed foodstuffs.

Stores around Wilkes Station. (Mike Pearson)

Nearby was an extensive dump area with many 44-gallon drums, broken down machinery, building materials and discarded cans and other containers. While the scale of the artefact material is very much greater than at Mawson's Huts, the same questions about artefact versus rubbish have had to be asked at Wilkes, and are still being asked. Hazardous materials, such as fuel oil and explosives, have been removed from the site in recent years, and many of the drums have been shipped back to Australia. Other artefacts, however, are able to be related to the history of the development of the station, or to the lifestyle of the occupants in the 1950s and 60s, and some, such as a home-made skidoo, can be directly related to the memories of occupants recorded in oral histories. These artefacts have great potential for the interpretation to visitors of the operation and human history of the early scientific stations.

The Madrid Protocol—balancing cultural and environmental values

The dilemma for the manager of historic Antarctic sites with extensive rubbish is highlighted by the development of the Madrid Protocol (*The Protocol on Environmental Protection to the Antarctic Treaty*, 1991). The Madrid Protocol, like the *Antarctic Treaty* itself, recognises the importance of historic sites in the Antarctic, and establishes a framework within which they can be managed effectively (Annex V of the Protocol). But the Madrid Protocol is primarily aimed at improving environmental management and protection, and Annex III deals specifically with waste disposal and waste management, including the removal of rubbish. Again, the question of what is artefact and what is rubbish is a central issue in making appropriate decisions that balance cultural heritage and environmental values of Antarctica.

Article 8 (4) of Annex V specifies that 'Listed Historic Sites and Monuments shall not be damaged, removed or destroyed'. The process of listing is reasonably straightforward, but is in the hands of the nation with an interest in the site to nominate it. Where there is a tension between historic and environmental values, as at Wilkes, the nation with major interest (in this case Australia) may be less willing to seek recognition of the historic site within the Treaty context. Heritage listing may be interpreted as imposing obligations that are at odds with the environmental obligations under the Madrid Protocol.

Article 1 (5) of Annex III of the Madrid Protocol states that:

> Past and present waste disposal sites on land and abandoned work sites of Antarctic activities shall be cleaned up by the generator of such wastes and the user of such sites. This obligation shall not be interpreted as requiring:
>
> (a) the removal of any structure designated as a historic site or monument;
>
> or
>
> (b) the removal of any structure or waste material in circumstances where the removal by any practical option would result in greater adverse environmental impact than leaving the structure or waste material in its existing location.

Note that the first paragraph refers to 'abandoned work sites of Antarctic activities', which can be read to mean any site of Antarctic human occupation including all designated historic sites. However, point (a) limits only the removal of 'structures', and not artefacts, which make up a part of many of the designated historic sites. The removal of 'waste material', which might be taken to include artefacts, is limited only if it has an adverse environmental impact outweighing the benefits of its removal.

This begs the question—are historic sites part of the 'environment' and therefore subject to 'adverse environmental impact' by the unnecessary removal of artefacts? The term 'environment' is not defined in the Protocol, but increasingly the works of man including historic sites are being included as part of the definition of 'environment' in many countries. If this broader definition of environment is used, historic artefacts are given a degree of protection by the Protocol—if the narrower 'green' definition of environment is used, artefacts have no protection at all unless they are within a listed historic 'structure'.

An example of responsible combination of environmental concern and respect for heritage values is the work carried out in 1992 at East Base, the 1940-48 United States research base on Stonington Island.[2] There the clean-up work was carried out in two stages, the first being a detailed cultural resource assessment including a site survey and limited archaeological excavation, followed by controlled and selective removal of hazardous and less significant material. The standing buildings were repaired, and areas of exposed artefacts potentially dangerous to visitors, but unable to be removed, were covered with gravel. It was accepted that the presence of some debris around the huts was part of the site's aesthetic and historic significance, and should be conserved to the extent that it did not pose an environmental or visitor hazard.

A similar approach balancing environmental and cultural values was applied at the former Australian Antarctic Research Expedition's Atlas Cove station on Heard Island (1947-55). Surviving buildings, in various stages of decay, were surveyed and recorded, as was the large area of windblown rubbish surrounding the site. In this case the decision was made that the environmental hazard, especially to wildlife, posed by much of

Not a pile of scrap wood, but the remains of a 19th century Swedish winter base in Svalbard. (Susan Barr)

the artefact scatter and the collapsing huts outweighed the historical importance of retaining the artefacts in situ, and extensive removal of artefacts and some buildings was undertaken.[3]

Conclusion

The challenge for the managers of Antarctica is the balancing of the obligations to conserve and protect both environmental values and cultural heritage values on the continent. The key to striking that balance must be the provision of resources for the adequate researching, surveying and analysis of the sites of past human activities, and of appropriate conservation works based on these findings. The presence of artefacts as rubbish need not be in conflict with the environmental obligations imposed by the Madrid Protocol if soundly based and effective conservation of historic sites is embraced as an equally worthwhile management objective to good environmental management.

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MAWSON'S HUTS HISTORIC SITE, ANTARCTICA: THE CONSERVATION MANAGEMENT PLAN AS A DECISION MAKING TOOL

Geoff Ashley and Richard Mackay

Abstract

Mawson's Huts Historic Site is an extraordinary, intact relic of the heroic era of Antarctic exploration and a symbol of Australia's historic past.

Built for the 1911–1914 Australian Antarctic Expedition and located at Cape Denison, Commonwealth Bay, the site epitomises the challenging issues that arise in conserving and managing highly-significant but fragile polar heritage places.

Over recent years tension has arisen in a diversity of approaches to conservation management: eager enthusiasts vying with reluctant bureaucrats and cautious scientists. Practical considerations, such as ice removal, ongoing visitation or the recladding of the fast-disappearing structures have remained matters of contention, while the environmental effects of this windiest place on Earth have taken their toll.

Recent initiatives and the coalescence of government interest and corporate benevolence have focused efforts on a long-term conservation program. Through this process, a comprehensive Conservation Management Plan[i] has been prepared and is now being implemented. This Plan provides clarity in management objectives and is focused on retention of identified heritage values as the basis for resolving tensions between stakeholder viewpoints and conflicting conservation philosophies.

Introduction

Polar heritage, perhaps more so than traditional heritage places, provides an eclectic mix of passionate stakeholders, physical challenges and philosophical dilemmas. By their very nature, such places are remote and romantic. Those from the heroic eras of exploration hold strong associative values but, paradoxically, are themselves highly fragile and exposed to extreme environments. Effective conservation requires a mix of technical skills and professional expertise, tempered by public sector support. Because of these values and circumstances, polar places may also have vocal commentators, philanthropists and interest from an enthusiastic, but distant, public community.

Mawson's Huts Historic Site, Antarctica, is a case study in this volatile cocktail of issues and tensions.

The place is an emotive site that represents different values to different people. The values are indeed heartfelt, but often in opposition. Some believe that, as an important part of Australian history, the relict physical fabric requires repatriation. Others rightly see the location of the site as an important physical marker of a bygone era. To Antarctic expeditioners and scientists, the site presents a mixed challenge and opportunity – well away from most of the Australian bases, it is an expensive and difficult place to visit, but at the same time provides opportunities for using innovative technologies.

Filled with ice and being abraded by katabatic winds, the fabric of the huts poses an enigma – should the ice be removed and the defective fabric replaced or covered over, or should natural processes eventually be allowed to take their course?

There is a real and continuing danger for a place like this that decision-making will be driven by the wrong motives: availability of resources raised through philanthropic fundraising; new technologies that allow physical approaches not considered before and increasing interest in Antarctic cultural tourism, rather than a good understanding of heritage values.

This paper outlines how the process involved in preparing a Conservation Management Plan creates a structured route through a minefield of phenomenological and empirical data to establish a values-based solution to conservation management.

Setting the scene

Located on the small rocky peninsula of Cape Denison and surrounded by the glacial ice cliffs of Commonwealth Bay, Mawson's Huts Historic Site is a complex of buildings, structures and relics of the Main Base of the Australasian Antarctic Expedition (AAE), 1911–14, led by Douglas (later Sir) Mawson (1882–1958). The site is a cultural landscape that includes the intact prefabricated timber Main Base Winter Quarters of the AAE (referred to here more simply as Mawson's Hut), three scientific huts (one intact and two ruins), other structures and numerous artefacts.

Fig. 1 Mawson's Huts Historic Site is a cultural landscape containing buildings, structures and artefacts of the Australasian Antarctic Expedition of 1911–1914. Mawson's Hut (upper), Transit Hut (lower right), Memorial Cross (lower centre) and artefacts (lower left). (Geoff Ashley 1997/1998)

As part of the Australian Antarctic Territory, the site is administered on behalf of the Australian Government by the Australian Antarctic Division (AAD). The AAD's responsibilities for activities at Cape Denison are derived from the Antarctic Treaty, 1961, with Mawson's Hut and the Memorial Cross on the list of Historic Sites and Monuments identified under the Treaty. Particular responsibilities for these items are derived from Annex V of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol), which requires sites not

Fig. 2
Ice filled western verandah entrance of Mawson's Hut in 1998. (Geoff Ashley 1998)

to be 'damaged removed or destroyed'. In this, the Treaty requirements do not stress a proactive approach to site management.

After the site was abandoned by the AAE it was left to its own devices for sixty-five years, apart from an overnight stay by Mawson in 1931 during the 1929–31 BANZARE expeditions[ii] and use by NZ, US, Australian and French scientists in the 1950s and 1960s as a shelter (one of whom apparently left the door of Mawson's Hut open, letting the ice in (see Figure 2).[iii]

The environmental conditions found at Mawson's Huts Historic Site are characterised by extremes. Mawson himself belatedly identified a contradiction about his chosen site as the best and worst of places: exposed rocks gave him a good building foundation but the exposure of the rocks also reflected the strength of winds that tear through the site, later recognised as the windiest place on Earth at sea level and named by Mawson as 'The Home of the Blizzard'.[iv]

In recent years influential commentators have decried the ruinous condition of Mawson's Hut as a national disgrace.[v] A motivating factor in many recent expeditions, therefore, has been a desire to 'save' Mawson's Huts. While concern was well meaning, and no doubt helped in obtaining funds, it exposes another contradiction: Mawson's Hut may be partly ice filled, but it is not a ruin and its well-designed bolted timber structure is in a fair-to-good condition given its age.

The perception of Mawson's Hut being a 'ruin' also comes from a bedraggled appearance caused by the scraps of packing-cases fixed over sail cloth to the roof and walls by Mawson to reduce drift snow ingress

Fig. 3
Packing-case battens that held down sailcloth in an effort to reduce wind-blown snow ingress form an evocative layer over the Baltic pine roof of Mawson's Huts. The effects of snow/ice abrasion are shown by the 'shadows' of battens now blown from the roof. (Geoff Ashley 1998)

(see Figure 3). The ice itself is a contradiction; it obscures the inside spaces of the Hut but stabilises its structure and provides a thermal mass to stabilise its internal environment (see Figure 4).

An inspection in 1996/97 also revealed a delicious paradox where the Antarctic environment is both the preserver and the potential death knell of Mawson's Hut; the cold makes it impossible for the usual organic timber threats to survive, while the snow and ice particles driven by the ferocious winds abrade the timber cladding to the point where the Huts' roofs were close to failure.[vi]

Mawson's Hut is also a visual contradiction. It shows its age through the patina of timber, metal fabric and artefacts and at the same time it is a frozen moment in time (literally in this case) with foodstuffs and artefacts forming a snap frozen portrait of the end of 1913. Fresh looking timbers kept bright by continual snow and ice abrasion reinforce the sense of this frozen moment (see Figure 1).

Fig. 4
The impressive volume in the centre of the partly ice filled Living Quarters of Mawson's Hut, with skylights open, during conservation works in 1998. (Geoff Ashley 1998)

Over the last twenty-five years the site has been the subject of five concerted and several minor expeditions to undertake conservation works; the most recent at the end of 2002. Each of these expeditions reflects the nature of conservation practice at that time.

An Australian Antarctic Division (AAD) expedition of 1978 investigated whether Mawson's Huts could be returned to Australia. This work removed ice from part of Mawson's Hut only to see it fill again in a matter of a few years. Conservation practice was only just emerging and was, at best, based on documenting proposed restoration works with little explanation of what values those works were intended to protect.[vii]

Two Project Blizzard expeditions in the mid-1980s were enthusiastic for action but encountered a cautious Australian Heritage Commission (the Australian Government's national heritage agency).[viii] This period reflects emerging conservation philosophy (what is important), but limited conservation planning (how to keep it). In this case the result identified what could not be done rather than what could.

Nevertheless, Project Blizzard increased knowledge of the site and led in 1993 to a conservation plan that provided an agreed framework to undertake initial stabilisation works.[ix] These and other works identified in a 1996/97 investigation were implemented in 1997/1998 by the AAP Mawson's Huts Foundation.[x]

In addition to providing evidence of evolving conservation practice, the expeditions also reveal a management environment that allowed contested site 'ownership' between enthusiasts, heritage professionals and scientists of different persuasions and a diffident bureaucracy. Also missing in this contested environment is the potential leavening role provided by wider community input.

The AAD position in the 1990s was that it would do what it could to assist conservation, but would not take a proactive role in conservation and management of Mawson's Huts as heritage conservation was not seen as a core responsibility.[xi] This reactive AAD role led to something of a gap into which self appointed experts, lay enthusiasts and professionals were happy to move.

The 1996/98 AAP Mawson's Huts Foundation returned to Australia with a strong desire for an agreed policy vision developed for the site. This viewpoint accorded strongly with the advice provided to the AAD by the Australian Heritage Commission. In parallel with evolving conservation practice in Australia, an agreed vision for the Mawson's Huts Historic Site was articulated through the development of a Conservation Management Plan.

The *Burra Charter* and The Conservation Plan

Foundation stones for the management of Mawson's Huts

As the first tentative steps were being made to conserve Mawson's Huts in the 1970s, an identifiable heritage conservation profession began to emerge in Australia. The Australia ICOMOS *Burra Charter* (derived from the International ICOMOS *Venice Charter* 1964), was adopted in 1979 and most recently revised in 1999. It remains widely used in Australia and internationally respected as a series of principles and processes that define the practice of conservation.[xii]

Fundamental to the philosophy underpinning the Charter is an understanding that conservation is about retaining the identified cultural values of a place and respecting all identified values, rather than some at the expense of others. Importantly, under its most recent revision, the Charter places additional emphasis on the significance of intangible heritage values – use, association and meaning.[xiii]

These considerations take on additional importance, when considered in the light of the issues at Mawson's Huts Historic Site – an emotive place, albeit with significant fragile fabric, but one which will always be beyond the direct tangible experience of most people.

Along with the *Burra Charter*, the preparation of Conservation Plans is now accepted by Australian Government agencies as the mechanism used to determine conservation policy for sites of heritage significance. At the core of the Conservation Plan is the assessment of cultural/heritage significance. A feature of the Conservation Plan process is that the heritage significance of a place (and where appropriate, its component elements) is defined first, free of all other constraints. Only then are obligations arising from significance and other constraints such as condition, owners' resources, environmental factors and legislative requirements considered in determining appropriate conservation policy.[xiv]

The Mawson's Huts CMP process

The AAP Mawson's Huts Foundation resolved to carry through the conservation efforts of 1996 to 1998 and, as a first step, held a seminar in late 1998 that aired viewpoints of government, professional and public stakeholders. Consultants were engaged to prepare a Conservation Management Plan (CMP) to guide the site into the future.[xv]

The seminar recognised that a clear long-term vision or objective was needed for the site's management given the high cost in conserving what are otherwise simple timber structures. Participants agreed that Mawson's Huts were worth the long-term effort that will be required in their conservation. There was a spectrum of differing viewpoints of what that vision may represent.[xvi]

The removal of ice remaining inside Mawson's Hut and the attendant issue of snow ingress were principal issues. No arguments were made as to the ice itself being significant. However, some professionals opposed ice removal for fear that it may lead to consequent impacts on artefacts inside Mawson's Hut. Some sought proof that long-term conservation achieved by ice removal was demonstrably better than ice retention. Others saw ice removal as a conservation aim to reveal significant fabric and spaces, but agreed that appropriate risk assessments were necessary.

These views represent a typical dialogue found in any significant place. Complex values balance between big picture and detailed views, which often reflect the preoccupations of the people involved. However, there was broad agreement that the monitoring of environmental conditions in Mawson's Hut would be a pre-requisite for any decision on ice removal and a monitoring program was implemented in the summer of 1998/99.

A key to the success of the CMP process was the close involvement and interaction of private and public sector stakeholders. The CMP was prepared under the guidance of a steering committee made up of the AAP Mawson's Huts Foundation, the Australian Antarctic Division who are custodians for the site, and the Australian Heritage Commission who provide heritage advice to the AAD and its Minister. The CMP process included a public consultation phase where the draft report was posted on the Internet and public submissions were received.[xvii]

One technique used to address and resolve conflicting values was an expert workshop, held following compilation and analysis of comprehensive data about the site. The workshop involved both technical experts and the multidisciplinary Conservation Management Plan team. This process addressed different categories and criteria for significance as defined by Australian heritage legislation.[xviii]

Specific values were articulated and debated, in workshop format, with the final output being a cohesive summary Statement of Significance. The Statement of Significance identified the site as rare in a world context and unique in the context of Australian history.[xix] The summary Statement also identified the importance of the intact cultural landscape setting of the site in providing a sense of place associated with the AAE. The external form and internal structure of Mawson's Hut, together with the impressive internal space, demonstrate a simple but strong architectural concept developed by Mawson himself.

The Statement of Significance provided a platform upon which a cohesive policy position could be developed – a platform that is clear of the clutter of conflicting viewpoints, enthusiasm for expeditions or the opportunities created by technological advances.

Of necessity, part of the review process for the conservation plan involved substantial discussions about the Statement of Significance with the Australian Antarctic Division (as responsible government agency), the Australian Heritage Commission (as statutory authority with responsibility for Commonwealth heritage management) and the AAP Mawson's Huts Foundation (as sponsoring organisation for both Conservation Management Plan and works programs).

The Mawson's Huts CMP conservation policy

Over the years, enthusiasm in relation to Mawson's Huts has waxed and waned for synthetic coating of exposed timbers, sophisticated monitoring of internal and external environments, use of membranes, tie-downs for the roof structure, and other technologically-advanced solutions that would never have been contemplated by the original explorers.

A key to good policy making is that it must be based firmly in an understanding of the values of the place, rather than our technical ability to achieve 'miracles' – significance, not technology, should be determinative. These values include the tangible values associated with the artefacts, documents and the buildings as well as the intangible values that are associated with an appreciation of a sense of place redolent of the AAE presence.

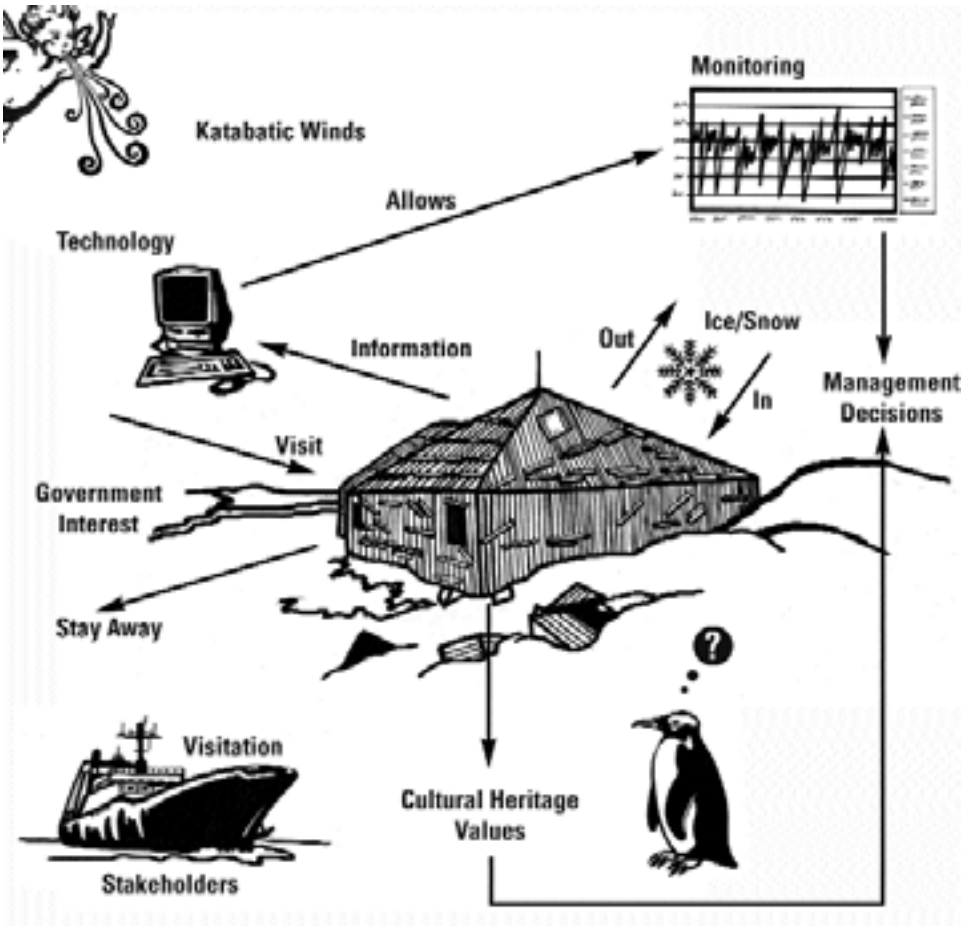

Fig. 5
The issues that influenced the development of conservation policy identified in Mawson's Huts Historic Site Conservation Management Plan. (Graphic Cecilie Knowles)

Notwithstanding the need to appreciate the heady mix of tangible and intangible values in developing conservation policy, other pragmatic constraints such as the remoteness of the site, difficulty of access and unknowns in relation to the structural and environmental conditions inside Mawson's Hut were all considered during policy development. Figure 5 provides a visual representation of some of the issues that influenced conservation policy development.

The conservation policy arrived at in the CMP is founded on the identified significance of Mawson's Hut and its use and associations, and the potential to reveal the significant internal spaces. In this the CMP established an aim to remove the ice and to manage snow and meltwater ingress, but **onl y** after determining that the risks (structural and environmental) are acceptable, based on a series of principles and pre-requisite assessments.[xx]

Pre-requisite assessments included the need for a structural engineering evaluation of the stability of Mawson's Hut and likely impacts of ice removal on the structure and internal environment. The monitoring of a reasonably stable environment inside the Hut over at least one full summer and winter season was also required. As significant variations in relative humidity (RH) were seen as a potential risk to the buildings and artefacts, a series of criteria was established that defined a maximum range of daily fluctuations relative to ambient relative humidity.[xxi]

Remote sensing environmental monitoring, established prior to the completion of the CMP, but completed after its finalisation, was therefore a key element in the decision-making process.

In this case conservation policy identified an aim and appropriate criteria, but deferred the management outcome to a future assessment process.

Implementation

The environmental monitoring station provided reliable, detailed data for temperature and relative humidity at both internal and external locations between January 1999 and January 2002.[xxii] This included the summer and winter conditions required by the CMP.

The monitoring data was considered and assessed in a Works Plan[xxiii] prepared as part of the environmental assessment and reporting requirements of the AAD's expedition that was undertaken at the end of 2002. The criteria contained in the CMP and the monitoring obtained between 1999 and 2002 together proved to be suitable in providing for future decision making.

While the 2002 expedition has not yet fully resolved the issues surrounding ice removal and snow ingress in Mawson's Huts, the works undertaken implemented many aspects of CMP conservation policy (including collections recording and management and further stabilisation works). The investigations and data will assist in future required assessments. In this way the framework established in the CMP ensures that works or research efforts in the conservation of the site are coordinated.

Conclusions

Recent action by the Australian Antarctic Division in mounting the 2002 expedition is a step forward in proactive conservation of the Mawson's Huts Historic Site and serves as a good model for heritage management by Antarctic Treaty members.

The model used in preparing a Conservation Management Plan for the site — private sector organisations working closely with the Government agencies – provides an effective exemplar for polar heritage conservation.

The approach advocated by the *Burra Charter* has been valuable in resolving conflicts and tensions about the manner in which the site should be treated and, particularly, the processes used to determine particular physical actions. Figure 6 summarises this approach. A clear understanding of the heritage values of the place underpins an overall objective to remove ice. However, having regard to other constraints and issues, the conservation policy outlines a process and the particular benchmarks and indicators required before ice removal can proceed.

The policy therefore provides a theoretical structure within which science, technology and monitoring programs feed directly into good decision making. The monitoring is a valuable tool in resolving conflicting issues between professionals with strongly-held viewpoints. However, it is only useful once the overall conservation objectives are clearly determined, in a policy framework based on a thorough understanding of significance.

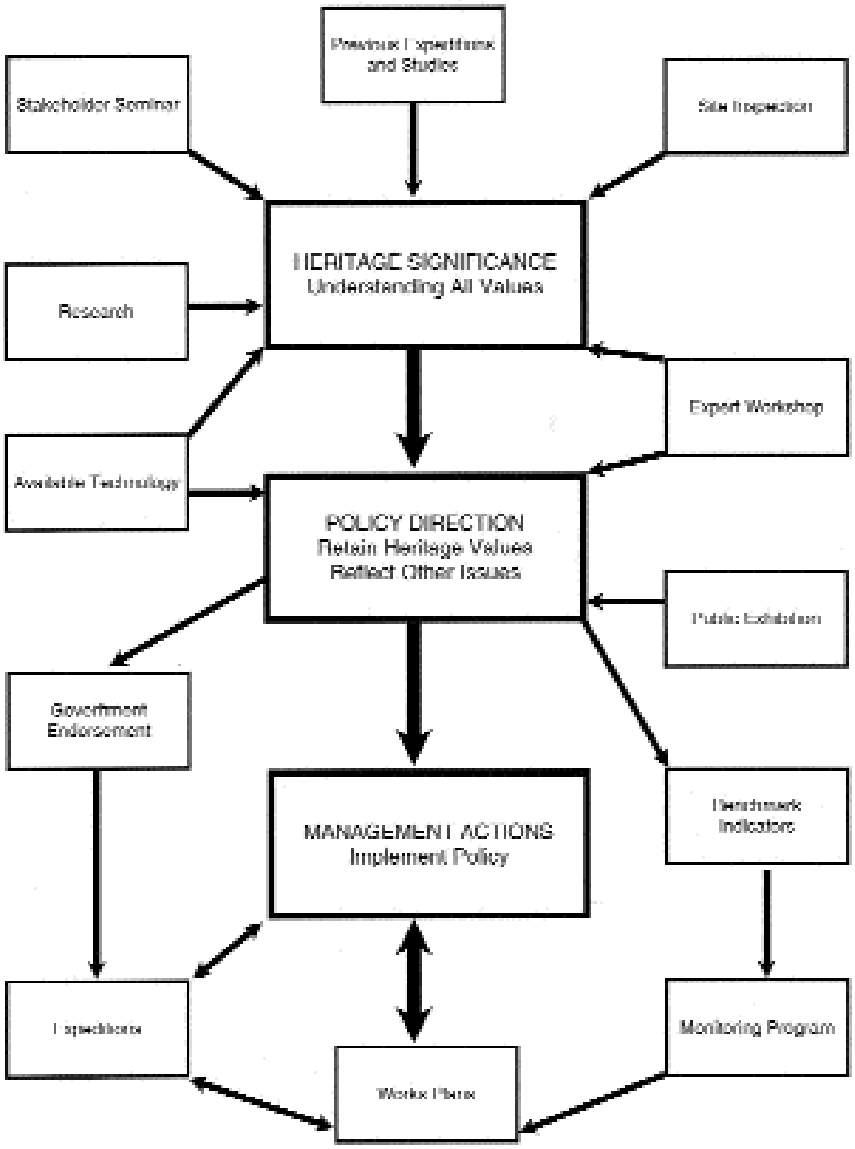

Fig. 6
Mawson's Huts Historic Site Conservation Management Plan – Outline of Process and Relationships. (Graphic Lois Brewitt)

While the Mawson's Huts Historic Site conservation planning process relates to a particular place and the circumstances created by the establishment of a fundraising/works program by a benevolent organisation, the processes and principles used in developing conservation policies have wider applications in polar heritage management.

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[i] Unless otherwise stated, material in this paper is sourced from Godden Mackay Logan, July 2001, *Mawson's Huts Historic Site Conservation Management Plan*, prepared for and published by the AAP Mawson's Huts Foundation. The CMP can be viewed at Godden Mackay Logan's website www.gml.com.au or through the Australian Antarctic Division website www.aad.gov.au.

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[x] An eleven-person team of the AAP Mawson's Huts Foundation spent two months on site between December 1997 and February 1998 undertaking conservation works and research identified in a 1993 draft Conservation Plan and a site inspection by Geoff Ashley of Godden Mackay Logan in January 1997. (Refer to the Godden Mackay Logan reports of 1997 and 1998 identified in the References for more details.)

[xi] Forward to the Mawson's Huts Historic Site Conservation Management Plan 2001 by the Director of the Australian Antarctic Division.

[xii] The *Burra Charter* (The Australia ICOMOS Charter for Places of Cultural Significance) published by Australia ICOMOS Inc 1999.

[xiii] Burra Charter Articles 1.2 (Definition of Significance), 3.1 (Cautious Approach) and 5.1 (Values).

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CANADA'S YUKON TERRITORY – HERITAGE AT THE EDGE

Doug Olynyk

Opportunities and challenges presented for heritage conservation under the influence of an evolving political and physical environment. Aboriginal land claims and a changing climate in Canada's northwest.

Canada's Yukon Territory is a rugged, mostly mountainous terrain carved out by glaciers, rivers, tectonic forces and weather. It has been barely scratched on the surface by human endeavours. Situated in the north-westernmost frontier of Canada, it borders the Canadian Western Arctic's Beaufort Sea and Alaska, USA. On the surface the Yukon appears a fresh new land, but this belies an ancient and exotic human heritage by New World standards.

One theory of the peopling of North America has bands of Asian hunter-gatherers following giant Pleistocene prey across a bridge of land (the former subcontinent of Beringia) linking the Old and New Worlds during the last Ice Age. If this is true, the Yukon First Nations people could be the descendents of the very first people on the continent. In a North American context this is the beginning of human history.

Much has changed – both politically and climatically - since the woolly mammoths pounded the open and dry, windswept grasslands of Beringia. Almost all of the Pleistocene vegetation and beasts have become extinct, making way for encroaching tundra and boreal forests and the creatures that inhabit those ecosystems. In the middle of the nineteenth century explorers, traders and missionaries, and the society that followed, introduced new and foreign technologies and cultural concepts to the indigenous population. The evolution of the cultural and physical climates continues of course and seems to be accelerating – generating a dynamic and challenging environment for heritage conservation. It is an environment that also compels creative and leading edge solutions to unique problems.

The Aboriginal Land Claim

Most of Yukon land and resources is subject to terms of land claim agreements between the federal, territorial and First Nation governments. There are 14 First Nation political groups in the Yukon. Every individual Yukon First Nation agreement is based on a template referred to as the Umbrella Final Agreement (UFA). Chapter 13 of the UFA – and subsequently, Chapter 13 in each of the specific agreements – deals with Heritage. One part of the heritage chapter outlines the ownership and management of certain types of heritage resources found on and off Settlement Land. Generally ethnographic resources that are directly related to the culture and history of First Nation people are theirs to own and manage. Conversely, heritage resources that are not ethnographic resources directly related to their culture are in the care of the Yukon Government. As usual things are not as clear as one would hope for when legal terms and descriptions are written into complex agreements.

A site that would be attractive to one culture is often the same for another. These include good vantage points, the confluence of resource-rich rivers and valleys and protective shelter. Visitors, when they first come to a new land, are often reliant on the graces of the local people for survival. Co-habitation is common, as is trade and intermarriage. This integration and interdependence in a remote, sometimes-hostile land blurs the boundaries of cultures at various locations in the Yukon. This heritage that is common to more than one culture, made up with distinctive components and combinations of each, is dealt with in specific schedules within the heritage chapter of land claim agreements.

There are various arrangements for the ownership and management of a number of cross-cultural historic sites in the Yukon. Some historic places are co-managed and co-owned, others are owned by either a First Nation or the Yukon Government, but managed according to cooperatively developed and approved management plans. The aboriginal land claim process has been beneficial in articulating and framing the management issues of many historic sites. The great value placed on historic places became very obvious during

land claim negotiations. As a result, heritage management clauses are now imbedded in Canada's Constitution as part of Yukon First Nation land claim and self-government agreements.

As an example, Rampart House and Lapierre House Historic Sites in North Yukon are co-owned and co-managed by the Vuntut Gwitchin First Nation and the Yukon Government. These abandoned sites are located in the Porcupine River drainage, above the Arctic Circle, and were 19th century Hudson's Bay Company (HBC) fur trading posts. Rampart House is on the Porcupine River right at the Alaska border and Lapierre House is on the Bell River near the Northwest Territory border. They were part of the farthest northwest reach of a wide network of historic HBC posts in Canada. The posts attracted at least seasonal settlement of the nomadic aboriginal people and eventually became a home to many families who still live in the region. According to the terms of the Vuntut Gwitchin Final Land Claim Agreement a management plan was developed for both sites. The plan was officially signed by the Yukon minister responsible for heritage and the chief of the Vuntut Gwitchin First Nation in July, 2001.

The management planning processes for co-managed sites have proved to be creative and collaborative exercises, each customized to the community involved – its talents and capacity. There is a blend of different cultural perspectives based on a common goal – to preserve cultural values and heritage resources for future generations. Broad public consultation is a critical component in terms of community buy in. By having meaningful input, understanding and some sense of ownership of the plan, local community members are more likely to be engaged with its implementation. It will be these people that will be the primary guardians and hands-on stewards of the resources. The process of planning and the iteration of emotions and ideas is more important than the plan.

The special conservation issues of Herschel Island

The Inuvialuit Final Agreement – the Canadian Western Arctic claim which came into effect in 1984 – established Herschel Island as Yukon's first park and protected area. The Yukon Government in consultation with the Inuvialuit manages Herschel Island Territorial Park. It is located a kilometre off the north coast of Yukon, in the Beaufort Sea, opposite the mouth of the Firth River. Sir John Franklin named the island in 1826 when he was on a mapping expedition along Canada's Arctic coast. Franklin encountered indigenous hunters living on the island. There is archaeological evidence of prehistoric occupation of the island dating back a thousand years to the Thule culture. The Inuvialuit name for the island is Qikiqtaruk, meaning "big island".

In 1889 American whalers began anchoring in the safe harbour at Pauline Cove (named after the wife of a United States naval captain). The whalers had followed the diminishing stock of northern Pacific Bowhead whales over the top of Alaska into Canadian waters. At the height of the Beaufort Sea whaling period in 1893/94 the number of residents of Pauline Cove was estimated at 1,500, making it the largest settlement in what is now the Yukon Territory. Inuvialuit residents sold meat, clothing and furs to the whalers. By the time Canada began exercising its sovereign rights it was 1902 and the whaling industry was in decline.

There are several conservation management issues that directly result from the unique geography of the island. The island is essentially a mound of frozen muck that was pushed up from the floor of the Beaufort Sea by the toe of a glacier from the last Ice Age. This mostly fine-grained silt is subject to tremendous freeze-thaw cycles, particularly on south-facing slopes during the constant daylight of summer. What occurs is massive slumping of the active soil layer as it slides down over a permanently frozen base (solifluction), and the flooding of lowlands by seasonal freshets. These are among the natural forces playing havoc on a hundred Inuvialuit graves just north of the historic settlement at Pauline Cove. Grave markers, sandblasted by arctic winds, are being pushed over and buried by stream sediments, and coffins are being turned over and pushed up through the freeze-thaw cycle, exposing corpses in some cases. This is obviously a great concern for the Inuvialuit. A team comprised of a leading expert in the geology of the island, a medical health officer and Yukon historic sites, archaeology and park staff was brought together to evaluate the situation and consult with elders and heritage officials from the Inuvialuit Regional Corporation. After much consideration it was decided that nature

Coffins turned over and pushed up by freeze-thaw cycles. (Yukon government)

Northern Whaling and Trading Company building – practically at sea level. (Yukon government)

would be left to take its course but that coffins would be covered with earth as they became exposed, the zone demarcated and visitors informed about the sensitive nature of the area and discouraged from treading upon it. Again the process of open and collaborative sharing of scientific and traditional knowledge was at least as important as the outcome.

Along with the whalers, the settlement at Pauline Cove has seen other visitors including missionaries, police, traders, and later, travelling scientists and explorers such as Roald Amundsen, Vilhjalmur Stefansson and ethnologist Diamond Jenness, who accompanied Stefansson on his Canadian Arctic Expedition of 1913-16. Left behind are a dozen historic structures including an Anglican Mission House, Pacific Steam Whaling Company (PSWC) and Northern Whaling and Trading Company (NW&TC) stores and warehouses as well as individual dwellings. These buildings are located on a spit of land practically at sea level.

The past decade has seen increasingly violent fall storms blowing from the west across the Beaufort Sea that have reshaped the shoreline and driven sea ice up onto land. Industrial sandbags were donated by Dome Petroleum to reinforce the shoreline in 1997, but were not enough to prevent ice from being eventually pushed into the most westerly building. A sheet-metal-clad shed attached to the west side of the NW&TC store/warehouse was so severely damaged in the fall of 2000 that it was disassembled the following summer. The structure had been fully recorded and the foundation system was left in place in another vain attempt to stabilize the shore. It came to the point that in order to save the remaining portion of the NW&TC building it needed to be moved back from the shore in the summer of 2003. The neighbouring Canada Customs Warehouse had to be moved first to make room. At this time one can only speculate as to whether the climate change is a temporary phenomenon or a precursor of things to come. Continuing erosion and/or a rise in sea level are a serious threat to the remaining buildings.

It came to the point that the remaining portion of the building needed to be moved. (Yukon government)

The town of Tuktoyaktuk by the Mackenzie River delta, to the east of Herschel Island. (Susan Barr)

One more change and potential threat to Herschel Island is increasing human visitation. Several cruise ships now stop at the island in the summer. This adventure or ecotourism in the Arctic is becoming more popular and travel is becoming easier as sea ice thins and retreats all along the Northwest Passage. As exploration and extraction of petroleum and gas reserves increase in the region even more visitors are expected. In the Canadian Eastern Arctic the land surface of bare bedrock may endure increased traffic, but the protection of the fragile land and ecology of Herschel Island requires serious consideration in order to cope with tourism. The island is an exotic oasis of flora and fauna and a refuge for many rare and endangered species. Polar bears, muskox, caribou, Bowhead whales and even walrus pass through and by on their rounds. Migrating waterfowl breed in the delicate wetlands around Pauline Cove. Hopefully the groundwork laid in establishing successful working relations and finding common interests amongst cultures through heritage management planning will help ensure the protection and preservation of both the cultural and natural heritage of the Canadian Arctic.

WHEN THE INDIGENOUS TRADITION AND THE SCIENTIFIC TRADITION MERGE: UKPEAGVIK IÑUPIAT CORPORATION'S SCIENCE CENTER IN BARROW, ALASKA

Glenn W. Sheehan and Anne M. Jensen

Barrow, Alaska, which at 500 km north of the Arctic Circle is the farthest north city on the North American continent, has been a staging point for Western scientific studies since 1881, when Lt. P.H. Ray (1885) and Sgt. J. Murdoch (1892) landed the Army Signal Corps expedition at Cape Smythe for a planned two year stay. E.A. McIlhenny, of hot sauce fame, resided in Barrow in the late 1890s collecting natural history specimens. V. Stefansson spent considerable time working in Barrow and sometimes travelled with Barrow Natives, valuing their help in the field and the opportunity to learn Barrow language and customs. K. Rasmussen (1927) brought his Fifth Thule Expedition to town in 1924, and many early aviators used Barrow as a way station (e.g., Wilkins & Eielson; Amundsen & Nobile). The U.S. Navy started modestly in 1944 with petroleum exploration and by 1947 had a multi-faceted research and logistics base in the form of Barrow's Naval Arctic Research Laboratory (NARL). NARL operated until 1980 (Norton 2001).

Barrow's history of scientific endeavor and exploration is noteworthy, more so when the large scale of Native Iñupiat Eskimo assistance and participation in research activities is considered. The past two decades prove this history to be unique: since the departure of the Navy, the Iñupiat have used their own resources to support and promote U.S. and international research. They capped their collaboration in 2002 by creating the Ukpeagvik Iñupiat Corporation (UIC) Science Center.

UIC was created in 1972 as part of the land claims settlement between the U.S. government and the Natives of Alaska. Each Native village was given cash and land, with ownership bestowed upon a new profit-making corporation, with shares evenly divided among all Native residents of the village. UIC is Barrow's village corporation. Just 10 years after Barrow's dog teams were replaced by snow machines as the normal winter mode of transportation, UIC was founded. Today UIC is one of the most successful businesses in the state of Alaska. Part of this success is due to the long association of UIC shareholders with scientists, an association that provided technical skills that are now applied to running a business.

As the Navy closed the NARL facility they placed an advertisement in the Anchorage newspaper for demolition of all of the c.100 standing structures. UIC succeeded in both preventing the destruction and in acquiring title to the land and buildings of this historic scientific research facility. Their transformation of a military base into a civilian enterprise is one of the most successful examples of its kind in the U.S.

The North Slope Borough, the local home rule municipal government, administers an area the size of the state of Minnesota. They were an early tenant at the renamed UIC-NARL facility, moving their research arm, the Department of Wildlife Management, to the complex. A former animal compound was converted to a laboratory and bunkroom and christened the Arctic Research Facility. Over the years, the Borough has provided room, board and some equipment at no charge to U.S. researchers, and to researchers from around the world, including Russia, China, and various European countries. Concurrently, the Borough has conducted significant research on bowhead whales and many other marine, terrestrial and avian species. Borough research typically builds upon Iñupiat Traditional Knowledge and employs Natives and Western scientists in research capacities.

The local community college is also based at the UIC-NARL facility. Ilisagvik College provides vocational and initial higher education opportunities to people from Barrow and the other 7 villages across the North Slope.

In 1992 UIC created the Barrow Environmental Observatory (BEO). The corporation set aside 7,466 acres of land as a research preserve. This is probably the only place in the world where indigenous people have taken their own land and reserved it for scientific studies. The BEO is in the process of being re-zoned as a Science Research District, the first such zoning designation in the United States.

In 1995, UIC, the Borough, and Ilisagvik College, along with the Barrow Elders and the scientific com-

munity, formed the Barrow Arctic Science Consortium (BASC). Their instructions to this new non-profit organization were straightforward: work to bring scientists and the community together; provide opportunities to local young people and students to work with scientists, similar to the opportunities older community members experienced and valued; and try to find a way to relieve the Borough and UIC from spending local funds to support national and international science projects that rightfully should be supported by national governments, not by a small Native community. At that time, and ever since, local revenues have been declining as the tax base of the Borough depreciates along with the aging built infrastructure of the Prudhoe Bay oilfields.

UIC also asked BASC to manage the BEO. BASC soon had a Cooperative Agreement with the U.S. National Science Foundation's Office of Polar Programs to provide logistic support to researchers and to conduct educational outreach to the public. Last year about 4,000 persondays of support were provided to visiting scientists through BASC. Another 3,000 persondays of support to scientists in Barrow were provided through other organizations. Seventeen Iñupiat students worked with research projects during the summer of 2002. Half a dozen Iñupiat now have permanent science jobs through BASC and through UIC's Science Division.

UIC President George Olemaun proposed developing the UIC Science Center in fall 2001. He envisioned a center documenting the history of Native and scientist interaction on the North Slope, educating students about this history and about science, and highlighting current research projects. Today over 120 scientific research projects are active in Barrow.

The UIC Board of Directors designated a building at UIC-NARL to serve as the UIC Science Center. In addition to the building, UIC provides utilities and some management services. In return, UIC asks the scientific community to provide exhibits and programs. BASC, through the National Science Foundation, has installed 4 traveling exhibits (history of NARL, Point Franklin archaeology, Frozen Girl of Ukkuqsi, the Barrow Environmental Observatory). Individual research groups have installed a Sea Ice Observatory and a North Slope dinosaur exhibit. Each Saturday afternoon a scientist, assisted by one of a cadre of local schoolteachers, makes a public presentation about an ongoing research project.

An ongoing BASC effort has created a database holding digital photographs and Global Positioning System coordinates for 2,000 research sites in and around the Barrow Environmental Observatory. Some of the research sites date back more than 50 years. This database is currently being expanded to include the inland village of Atqasuk, another currently active research location with a rich science history.

A "grey literature" project is attempting to retrieve and digitize unpublished and poorly circulated historic research reports. Individual scientists are being encouraged to provide their working papers, archives and photographs and slides for digitizing. The first volunteer for this effort is the recently retired former Senior Scientist for the North Slope Borough Department of Wildlife Management, Dr. Tom Albert. Many crates of documents and about 7,000 slides have been digitized by BASC with support from the U.S. National Park Service Shared Beringian Heritage program and from the Alaska-based Rasmuson Foundation.

This documentary material serves an obvious historic purpose. It also provides useful baseline and background data for current research projects. Some scientists have begun to repatriate items of material culture along with their data, and non-scientists also have begun to contribute. For instance, artifacts collected decades ago from Nuvuk, the abandoned village on the tip of Point Barrow, have been sent to UIC. Photographs showing the original construction of the NARL camp have been sent by a former sailor.

Barrow is rich in historic material remains. These range from the original 1881 Army Signal Corps station building (see illustration) to the UIC-NARL facility itself, a district which is old enough and certainly significant enough to qualify for the U.S. National Register of Historic Places. Some houses in Barrow proper are constructed from parts salvaged from sailing ships. Other houses and outbuildings incorporate salvaged components of a Nike missile launch complex. Some homes are former NARL buildings that have been dragged into the village. Beneath Barrow is the historic archaeological village of Ukpeagvik (Hall 1990), which in turn sits atop prehistoric semisubterranean houses that go back as far as the Birnirk archaeological period, c.AD 400 - AD 800.

The Iñupiat people of Barrow have a long tradition of innovation and acceptance of change while maintaining a central social and subsistence focus on whaling (Sheehan 1997). Starting in 1881, they have become ever more involved in Western research activities, a trend accelerated by the longterm presence of the Navy and maintained under their local government and through other local organizations. Author Jack Williams

Front view of main building, United States Signal Station, Point Barrow, Alaska. (Ray 1885)

has asked, "I wonder if it's correct to say that the 'traditions' of the Iñupiat today include not only activities such as whale hunting, but also working on and managing science camps and projects?" The answer is yes, the people of Barrow have capitalized upon their history to make Barrow America's Science City.

The 125th anniversary of the first International Polar Year (IPY) is 2007. Barrow is the premier example of continuing scientific heritage from the IPY. Both the built environment and the inhabitants reflect past scientific accomplishments and forward-looking research. We expect Barrow and the UIC Science Center to serve as focal points in commemorating the IPY.

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HERITAGE IN THE FRENCH SUB-ANTARCTIC TERRITORY: BETWEEN URGENCY AND EMERGENCY

Jean-François Le Mouël

Terres Australes et Antarctiques Françaises (TAAF) is an overseas French territory which can be divided into two distinct parts. The Antarctic part consists of the district of Terre Adélie, while the Terres Australes are scattered over the Indian Ocean and range from 50°30' to 77°30' E and from 37°52 to 50°S. This part includes 3 districts: the Kerguelen Islands, the Crozet archipelago and the islands of St Paul and of Amsterdam. Close to the Antarctic convergence, the two groups of Kerguelen and of Crozet belong to the sub-Antarctic climate. But by their northern position off the "roaring forties", St Paul and Amsterdam, 90 km from each other, are favoured by milder climatic conditions. Nevertheless for commodity we consider St Paul and Amsterdam as part of the sub-Antarctic group.

St Paul and Amsterdam : historic milestones

The milder conditions were not the appealing factors for human beings, but rather the fact that the islands are located midway between South Africa and Australia, and that they are on the Great Circle route from one continent to the other. Finally, sailing ships could find there for several months each year favourable winds to cross the Indian Ocean. Today's Amsterdam Island was first sighted on 18th March 1522 by Magellan's crew on their way back home. A hundred years later, the sailors of a Dutch ship discovered the southern island, St Paul. At the end of the 18th century American and British sealers had started exploiting the seals which gathered on the beaches. When this activity stopped in the 1820s, the slaughter had been so intensive that the Amsterdam and St Paul shores were almost empty of sea mammals. In 1843 the islands were claimed as French property, and a fishing station was established and run until 1853. Although the activity had then officially ceased, when the *Gauss* passed by in 1903 she was welcomed by fishermen from La Réunion.

Both these islands saw frequent passages of hunters (sealers and whalers), fishermen and shipwrecked who stayed there for a limited time, but never with the intention of colonizing the islands, although a brief attempt was made in 1871. During the second half of the 19th century several scientific expeditions visited the islands, among others, the Austrian *Novara* expedition (1857), the French Transit of Venus expedition (1874-75), the German *Valdivia* (1899). On her way back from Antarctica via Kerguelen the German *Gauss* expedition briefly visited St Paul (1903). Already the *Valdivia* had pointed out the presence of rock lobsters (*Jasus paulensis*) as an important marine resource, and in 1928 a French lobster-canning factory was established on St Paul. Up to a hundred fishermen from Brittany and Madagascar were brought in and the business flourished until 1931, when beriberi decimated the small population.

Besides sending several navy ships to either island or to both in order to reaffirm French rights (*Eure* 1893, *Antarès* 1931, *Bougainville* 1939), the motherland did not care much about the islands until World War II, when England expressed the intention to establish a weather station on St Paul. The end of the war with Japan put an end to that project. Nevertheless a meteorological station was established in 1949 on Amsterdam by P. Martin de Viviès. This is the name of the scientific base which has existed since without interruption.

Historic traces on St Paul and Amsterdam

It should be very unlikely, although not impossible, to find any clues of the first human visits on either of the islands. Engraved stones have been discovered on both islands. Most of the time they are witnesses to the sojourn of wrecked men and briefly tell their stories, mentioning the name of the wrecked ship and of her captain, the date of wrecking, and the names of the castaways. Sometimes a short sentence expresses their loneliness and their hope of release.

St Paul yields a dozen house ruins. It has not yet been possible to date them, but they were probably built by fishermen or sealers and re-occupied by members of the scientific expeditions and by castaways. In Amsterdam an archaeological test excavation allowed us to locate the foundations of Hurtain's house from the colonization attempt in 1871.

Kerguelen and Crozet Islands : historic milestones

In 1772, in his quest of the famous *Terra australis incognita*, Yves Kerguelen de Trémarec discovered the island which now bears his name. He took possession of it in the name of the King of France. The same year Marion Dufresne did the same with île de la Possession, one of the islands of the Crozet archipelago. From their discovery and for a century, the history of these two groups of islands is much alike. Soon after their discovery whalers and sealers arrived (1791 in Kerguelen and 1803 in Crozet), most of them being Americans from the East coast. Sometimes their campaigns lasted several years. On arriving they used to unload ashore part of their gear which was not necessary for the hunt itself. Part of their equipment was the try pots that were placed on brick-built furnaces. But around 1830~40 it seems that the trying out of minced blubber was not done ashore any more, but directly on the decks of the whaling ships.

Both groups of islands were visited by the scientific expeditions of several nations, although not all of them were able to land at Crozet due to bad sea or weather conditions. From the beginning of the 20th century, several French expeditions stayed in Kerguelen. Business plans considered for Kerguelen involved developing sheep breeding and re-developing whaling, but the former was not a success and the sheep station closed in 1929. The revival of whaling was decided as a joint venture between the French Bossière brothers and the Norwegian Storm Bull C° which had funds and experience in the matter. In 1908, a whaling station was built on the southern coast of Golf du Morbihan, at Port Jeanne d'Arc. Soon after WW I floating factories made the shore factory obsolete, which was definitely closed in the late 1920s.

Historic traces on Kerguelen and Crozet

Of course, this whaling station constitutes one of the most conspicuous witnesses of the past on Kerguelen. The scientific expeditions also left quite a number of remains behind. One can mention those of the Transit of Venus expeditions on five different spots on Kerguelen. The larger – an English one – in Observatory Bay was reutilised several times by the German Drygalski's expedition and by the French Rallier du Batys' ones.

Numerous cairns were also built by sailors on the scientific expeditions. The one on the northern shore of Baie de l'Oiseau (Port-Christmas) is quite impressive with its diameter of 4.5m and height of 3.5m. It could possibly have been built by the people of the *Challenger*.

Cairn on the northern shore of Baie de l'Oiseau, (Port Christmas). (Jean-Fran ois Le Mou l)

The witnesses of the land claims have all the same typology: a flag mast and a brass plaque for EURE 1993, an erected cylinder of concrete with a brass plaque for the ANTARÈS 1931, and a small pyramid of concrete with a cast-iron plaque for the BOUGAINVILLE 1939.

The most numerous vestiges of the whaling and sealing era are obviously the try-pots and their stone or brick built furnaces. They are scattered along the shores of Kerguelen and Crozet as well. Their concentration at certain spots on the shores reveals places which were not only used for trying out seal or whale blubber, but also used as depots where whalers left their equipment between two campaigns. Some of those whalers never came back and their spars are still lying on the ground presumably in the exact position where they had been left.

Graves - some of them being cenotaphs - are scattered everywhere, but two main concentrations can be mentioned, in Anse Betsy and Ile du Cimetière on Kerguelen. A few graves were found on Crozet, but no real cemetery.

It is worth noticing that till now no petroglyphs have been found on Kerguelen and Crozet, where wrecks were so numerous. However several cabin ruins were located on both groups of islands. Several of them had obviously been built by wrecked whalers expecting rescue ships. This is notably the case with John Nunn's "Hope Cottage"[1], which we located in 1994 at Pointe Charlotte (the Long Point of the whalers) on the Courbet peninsula (Kerguelen). We excavated it in 1994 and 1995.

Corrosion effect on iron boilers of the rock lobsters canning factory of St Paul. (Jean-Fran ois Le Mou l)

From historical traces to a heritage consent: A political path towards recognition

In 1993, the High Commissioner of the Territory accepted the proposal to develop a project to consider the historic traces in the Territory. This author was appointed to conduct an inventory and produce a global report by 2000. Given the logistic difficulties, it was estimated that this time span was necessary to complete such a pioneering task. A first field work was conducted on the Kerguelen mainland during the 1993-1994 southern summer. Yes, there were historical remains; yes, we could consider them as part of a heritage. However, they were in such a bad state of conservation that it was most urgent to undertake their salvage. So what were the threats ?

First of all, of course, time was passing. All the surface remains are subject to the harshest weather conditions, of which the winds of the "roaring forties" are certainly among the worst factor of corrasion of the wooden elements. The atmospheric salty humidity is a constant corrosive factor on all islands: no spot even of the largest one, Kerguelen, is more than 20 km from the sea. On St Paul and Amsterdam (much smaller, St Paul is 2 x 3 km !) the effect of corrosion is increased by a oceanic subtropical climate, whereas the winds are nearly as constant, although less strong. A good example of the peculiar corrosion effect on iron is seen on the picture of the boilers of the rock lobsters canning factory of St Paul.

Nonetheless, there is no doubt that the greatest danger came from human beings! Until this first professional heritage expedition in the Territory, all the material evidence of the past had been considered as rubbish. The permanent bases were created between 1949 (Amsterdam) and 1961 (Crozet). From this time onwards, 250 to 300 people had been – and are still – sent yearly to the bases for maintenance and scientific purposes. For most of these young people it was very tempting to bring home some "souvenirs" from their long stay far from their motherland. At that time

heritage, which was not recognized as such, paid a large tribute to their lust. Of course these “old times” were seen as part of history, but a history for which no feelings existed. How else could it have been, when one considers the gap between, for example, the American whalers and the occupants of the newly established bases? Further, these new occupants were just passing by, and there is no permanent population which could develop emotional ties with the area.

Persuasion was the first line. Articles in newspapers, radio and TV interviews, conferences, all the media were used to inform and to develop the awareness of existing heritage in the TAAF. This author estimated that the whole heritage was in a state of urgency and would soon disappear if strong action was not immediately undertaken. Of course persuasion partly stopped the haemorrhage, but the Administration of the Territory had no legal text to prosecute a person who might deliberately wish to plunder a site. In fact, no law existed to protect heritage in the Territory[2] !

The Administration then began to cope with the situation. Laws were promulgated and their decrees issued. Two main sites, the whaling station of Port Jeanne d’Arc and the entire island of St Paul, are now protected by heritage law. The protection extends to artefacts. Noone is supposed to remove any artefact; should an artefact be found, the finder is requested to inform the chief of the base and to fill out an official form. Information is transmitted to the *Mission du Patrimoine historique et des sites archéologiques*, a recently created Department of the territorial Administration. For the first time in the territorial history, the High Commissioner lodged a complaint against X for stealing two artefacts in Kerguelen.

The *Mission du Patrimoine historique* is in charge of the scientific research dealing with heritage, and leads archaeological investigations in the field. Simultaneously, a *Commission du Patrimoine historique* (Heritage Committee) was created in 2000 and its members nominated. This consultative Committee of eight members composed of academic people, archaeologists, historians and specialists in conservation, meets twice a year and proposes actions to “inventory new sectors of the Territory, to preserve and to enhance remains already found”. It is noticeable that within few years remarkable actions have been promoted to respond to urgency.

Facing emergency

Despite the above-mentioned efforts, the situation remained crucial for several sites and, in particular, for the whaling station of Port Jeanne d’Arc in Kerguelen. This station had been under the harshest conditions for

Whaling station – Port Jeanne d’Arc in Kerguelen. (Jean-Fran ois Le Mou l)

almost a century and without almost any care. In 1993, when this author visited it for the first time, all the buildings of the factory itself had collapsed as well as two of the main dwelling houses. From the whole station only two dwelling buildings, plus a workshop and a piggery, were still standing. The two houses, which had been used by the French since the creation of the base of Port-aux-Français, had been cared for a little, but the workshop and the piggery were on the verge of falling down. In January 2000 when I came back these two were in an even worse condition, if possible. It was then decided to act.

Samples of wood were taken from the frame and the boarding. The species was determined by the Museum of Natural History in Paris and the necessary timbers and wall boarding ordered accordingly. The style of the hinges and hooks was also defined and it appeared to be of "*Late Empire*", a style which was still in use in Norway in the beginning of the 20th century. Good copies were found in Scandinavia. Small painting samples were sent to our colleagues in Norway, they were analysed, and the original "English Red" reproduced by a Norwegian factory.

Whaling station buildings of Port Jeanne d'Arc – before restoration. (Jean-Fran ois Le Mou l)

The expedition arrived on the spot by the end of November 2000. It was composed of specialists in the restoration of historical monuments, i.e. mainly carpenters, of an archaeologist and of a land surveyor. Plans of the ruins were drawn. Where parts of the buildings were missing, old pictures selected from our iconographic data base helped us to fill the gaps. Then the remains of the corrugated iron and of the wall boarding were removed. The wooden frame appeared and all its elements, carefully labelled, were dismantled. They were then "exported" to the base of Port-aux-Français to be cleaned and eventually repaired by the carpenters. Meanwhile the rotten floor was removed as well as the bearing joists. Then the archaeologists undertook a painstaking excavation, which yielded hundreds of artefacts ranging from screws and bolts to shoes… attesting the presence of women in the whaling station!

Whaling station buildings of Port Jeanne d'Arc – after restoration. (Jean-Fran ois Le Mou l)

After the excavation, the carpenters came back to rebuild the frame, at the top of which a Norwegian flag was hoisted. 95% of the original wood was reutilised, 4% of "old wood" was taken from a collapsed dwelling house and 1% of new wood completed the framework. But 100% of boarding and of floor had had to be replaced by "new wood" of the same species and quality as the original. The painters gave the final touch, adding to the heavy surgery the cosmetic one. The operation had lasted for 4 months and cost about 30500 Euro, wages excluded.

Other operations are already planned at different spots in the Territory. No time is to be lost and an urgency may suddenly becomes an emergency. Definitely, we have no choice.

Footnotes

[1] Clarke W.B. (ed.), Narrative of the wreck of the "Favorite" on the island of Desolation : detailing adventures, sufferings and privations of John NUNN (..). London , 1850.

[2] Because of the juridical status of the Territory motherland laws are not automatically applied in the TAAF.

GERMAN METEOROLOGICAL AND MAGNETIC BASE STATION ON THE KERGUELEN ISLANDS (1901-1903)

Cornelia Lüdecke

History of German Polar Research until 1945

A German polar heritage programme is still a desideratum, although Germany contributed to the discovery of the polar regions a great deal. Besides economical aspects like whaling in Arctic and Antarctic waters in connection with existing or planned whaling stations, there had been various scientific overwintering expeditions to Greenland for glaciological and meteorological investigations. Other stations had been established at Kingua Fjord (Baffin Island) and South Georgia (Sub-Antarctica) for magnetic and meteorological measurements during the first International Polar Year 1882-1883. In Svalbard long-time series of meteorological data had been taken from 1911-1914 and 1941-1945.

After wintering over, these expeditions abandoned their houses and other establishments with the idea that they may be of good use as shelter for shipwrecked persons. In Svalbard, sometimes the houses had been moved to other places, but during World War II most of the weather stations had been destroyed.

Referring to Antarctica the situation is quite different. There had been three German expeditions until 1939. The first German Antarctic Expedition (1901-1903) was part of an international meteorological and magnetic co-operation, initiated by its leader Erich von Drygalski and in which Great Britain, Sweden, Scotland and later France participated to investigate the still unknown Antarctic continent at the turn of the 19th to the 20th century. The German working area had been defined at 90°E in the south Indian Ocean sector of the Antarctic coast. Unfortunately, the expedition ship *Gauss* was trapped in the ice at the Antarctic Circle for a whole year. Scientific observatories had to be established on sea ice 85 km off the coast. On the continent, the ice-free extinct volcano Gaussberg of 366 m height was discovered, being the only ice-free spot on the endless white ice cap. Besides a cairn on top of the volcano, nothing is left in Antarctica to remind us of this very successful expedition, the results of which had been published in 20 volumes and two atlases, which gave the expedition the name “universitats antarctica”.

There had been two more German Antarctic expeditions before World War II. Wilhelm Filchner wanted to investigate the south-eastern Weddell Sea, where his ship was trapped by ice drifting in the Weddell Gyre for about a year (1911-12). Filchner could not land on the continent to build a station, so nothing remains there from his expedition. Alfred Ritscher guided the third German Antarctic Expedition (1938/39), which carried through an extensive aerial photogrammetric survey of Neuschwabenland during a summer campaign, but no work on the continent itself.

German Station at Observatory Bay (1901-1903), Kerguelen Islands

Referring to the international co-operation of Antarctic expeditions at the beginning of the 20th century, a base station for the German expedition was to be established at an island as far south as possible. The Kerguelen Archipelago seemed suitable to connect meteorological data from the unknown south to data from the known, because it had been the destination of several scientific expeditions in the late 19th century.

The observation of the very rare transit of Venus in front of the sun from many places on the earth was needed by astronomers to calculate the distance between earth and sun, called Astronomical Unit. On 9 December 1874, the transit could be observed again and Kerguelen was chosen as a favourable location providing a long base line together with other stations. An American expedition had its observatory at Pointe Molloy in the north-east and a German station was established at Betsy Cove in the north-west, while a British station of the HMS *Volage* was situated at Observatory Bay in Royal Sound. Beside the astronomical observations, meteorological data were taken as well. When these expeditions went home, they left their observatories, living huts and rubbish on the island.

Fig. 1
Remaining upright timbers of the British Volage station at Observatory Bay in Royal Sound, Kerguelen in 1901, before they were used for the German accomodation hut. (Geographical Institute, Technical University, Munich)

In connection with the international meteorological and magnetic cooperation, a German base station was established at Kerguelen 1901. Here a depot of provisions and a dump of bunkering-coal was to back up the *Gauss*, linking the expedition with civilization. The German station was placed right at the site of the former *Volage* expedition at Observatory Bay (49°25'S and 69°53E), where supplies and earlier buildings had been left behind. The pillars to support astronomical instruments were still standing and the pathways in good order. Only the wooden buildings had been destroyed by gales within the past 27 years. The men were glad to have the additional timbers and other woodwork from the British expedition for their buildings.

Fig. 2
The German accommodation hut at Station Hill in 1902. (Geographical Institute, Technical University, Munich)

East of the low Station Hill of lava, the Germans built an accommodation hut and several observatories. The accommodation hut *(Fig. 2, No. 1 in fig. 3)* measured 4,70 m x 6,70 m and was built on the beams of the former British hut. The floor was covered with linoleum and the roof with roofing felt. The walls were insulated with bruised cork and impregnated linen on both sides. Two rooms were heated with a cooker or a stove. A small hut south of the house held provisions, as well as a workshop for smithing and carpentry. Ground water stood at a high level, so a well *(No. 3 in fig.3)* was dug in the south-east of the hut, whereas the latrine *(9)* was set to the north.

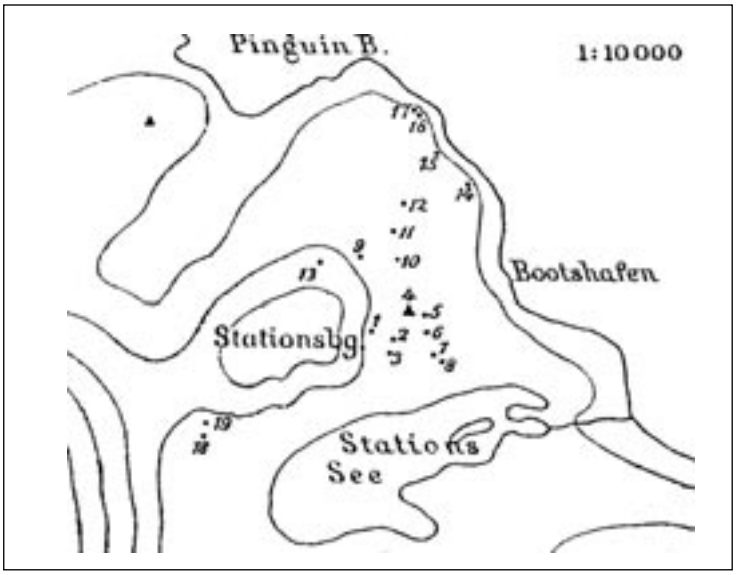

Fig. 3
Sketch map of location of structures associated with the German station. (Drygalski, E.v., 1912, Deutsche S dpolar-Expedition (1901-1903), Berlin, Bd. II, table XVIII.)

The little observatory huts were prefabricated in Germany, but details had to be solved on the spot. The "variation house" measured 4,00 m x 4,20 m with a ceiling at 2 m and an additional cold porch at the entrance of about 2 m^2 *(19).* Lighting was provided by an electric installation, which received the energy of 45 big Leclanché elements (batteries). The house was heated with a special regulating stove made of copper. A big sandstone plate from the *Volage* expedition was used as the foundation for the sensitive instruments. A second base plate was built with two layers of bricks also of British origin.

The octagonal “absolute observatory” *(7)* had a maximum diameter of 3,50 m measured to the outside edge. A white stone pillar and a circular sandstone plate with a diameter of 75 cm, both of the *Volage* expedition *(4)*, were used for foundations as well. Meteorological instruments like a rain gauge *(2)*, photometer *(5)*, apparatus to measure air electricity *(6)*, earth thermometer *(10)*, insulation thermometer *(12)* and an English hut used as a weather house, *(11)* were placed between Station Hill and the shoreline. A wind vane *(15)*, a small and a large anemograph on a heavy base were established at the shore *(17 & 16).* The instruments were connected with the accommodation hut by electrical light wires or signal wires.

Additionally a meteorological high station was set up at 160 m on top of a hill called “Treppe” (stairs), about 2 kilometres to the south-west. The little boat *München* found its harbour (“Bootshafen”, see figure 3) at a small inlet close to the station, where a landing stage was constructed with British material. A water gauge was also installed at that place. In January 1902, the *Gauss* visited the station and left behind about 140 tons of Westport coal and a depot of naphtha, fire wood and plank boarding.

When the meteorologist Josef Enzensperger (1873-1903) died at Kerguelen due to beriberi, he was buried at the north slope of the Station Hill close to the station *(13).* The tombstone had the inscription “J. Jos. Enzensperger / Mitglied der Deutschen Südpolarexpedition / * 8/II 1873 † 2/II 1903”. The station was abandoned on 1 April 1903 and all establishments were left behind with closed doors and windows. Nevertheless, the buildings were razed to the ground by gales from the north and northeast in the following years and the Westport coal was scattered all over.

Relevance of the Kerguelen site for today

When the Alfred-Wegener-Institute of Polar Research was established in West Germany in 1980 to provide logistics and manpower for the exploration of the Antarctic and later also of the Arctic, the history of German polar research was not institutionalized as well. Due to this nobody took care of historical sites of German polar research. Occasionally, this was done by people from other nations like Scandinavians in Svalbard or France on the Iles Kerguelen.

As already mentioned, besides the German site at Kerguelen and the German station at South Georgia of 1882-1883, also naturally destructed, nothing reminds us of German Antarctic expeditions before World War II. The Kerguelen site is especially interesting, because it served the same purpose as the Antarctic expedition itself – meteorology and magnetism – using the same instruments. At Kerguelen, a station functioning for a full year was established, which could not be realized on sea ice at the Antarctic Circle, where the *Gauss* was stopped by ice. So the Kerguelen site provides the only example of German scientific entrepreneurship referring to the exploration of Antarctica in the Heroic period. Due to this, it has a unique relevance to the history of German polar research.

The situation today

The strong prevailing winds have already destroyed all establishments. Only foundations and heaps of timber and woodwork can tell us where the accommodation hut, observatories and other installations had been. As the station had been established on French territory, the French became interested in this place. Polar heritage is already institutionalised in France and French scientists had been the first to look at that special site, where two nations in their time had very successfully investigated various scientific problems. Jean-François Le Mouël (Terres Australes et Antarctiques Françaises) made a first survey in 1994, which is very promising. Many spots can be still identified as observatories or other huts by their debris and outline. Pillars, foundations, bedsteads, empty bottles and wooden barrels for flour are still there.

Planned international project on Kerguelen

On the occasion of the centennial of Enzensperger’s death in 2003, a trilingual plate was set in November close to his grave, also commemorating the German and British stations at Observatory Bay. This shall also serve as documentation of a long tradition of international scientific work on Kerguelen.

Besides this commemoration, Jean-François Le Mouël is in charge of arranging an international archaeological expedition to Kerguelen. Joint fieldwork of British, German, and French participants will identify the remains of the *Volage* and the *Gauss* expeditions.

Memorial plaque commemorating Josef Enzensperger and the German and British stations at Observatory Bay. (Stig -Tore Lunde)

For identification of German material, we can use primary sources such as published and unpublished reports, diaries, maps and pictures, which are kept in German archives and in private possession. An official file concerning the observatories still exists, including a list of all material used for their construction.

It will be a very interesting task to separate the British and German remains and to reconstruct the original plan of the stations. Then we can get a feeling of the scientific and social life of the inhabitants. From the scientific point of view, it is very important to learn more about the locations, where the astronomical, meteorological and magnetic instruments had been installed.

We hope that the planned fieldwork will provide enough material for a proper documentation of the site to apply for financial support of its conservation. It might become one of the highlights of scientific-orientated tourist cruises sailing in the south Indian Ocean. As we have to deal with a German station mixed together with a 27 years older British station on French territory, documentation and conservation can only be done within co-operation from all three countries. And last but not least the German station at Observatory Bay on Kerguelen should be given official polar heritage status.

ARCHAEOLOGISTS DOCUMENT HISTORICAL HERITAGE IN THE SOUTH SHETLAND ISLANDS

Ruben Stehberg

Introduction

Since 1983, Chilean archaeologists from the Museo Nacional de Historia Natural (MNHN) with the support of Instituto Antartico Chileno have been conducting historic archaeology research in different areas of the South Shetland Islands, off the tip of the Antarctic Peninsula.

The objective of the first phase of the research, corresponding to the period 1983-1995, was to obtain material proof of the participation of sea-faring aboriginals from southernmost South America in the hunting activities undertaken by sealing enterprises from the northern hemisphere (principally American and British), during the major part of the nineteenth century.[1, 2]

This study commenced with the finding of two possible projectile points underwater at Admiralty Bay and Chile Bay by biologist Victor Ariel Gallardo between 1970 and 1973, and by the discoveries of a female skull and femurs at Cape Shirreff by biologist Daniel Torres since 1985. This skull has bioanthropological characteristics which show that it belongs to an indigenous or mixed race woman aged 20 years, and her characteristics are compatible with the native population of southernmost South America.

It is important to note that the historical documents recording Antarctic activities do not mention the presence of aborigines on board the ships or in the field camps, but a more detailed analysis of the record suggests the presence of other people apart from the official crew, especially in sealers' groups that worked on the beaches of the islands.[3] Through the fieldwork the following locations were archaeologically identified: Cape Shirreff, Black Point on Livingston Island, Desolation Island and part of Admiralty Bay. A collection of historical samples was formed and stored at MNHN, with a small exhibition in some display cases on the first floor. There is another exhibition in the Museo Salesiano in Punta Arenas.

Fig. 1
19th century remains (Beach 11) (Ruben Stehberg)

In 2000 a new phase of the investigation was started which aims to make a systematic inventory of the cultural and historical heritage of the South Shetland Islands. The idea is to have a complete record of the historic material dating from the nineteenth and twentieth centuries, and to commence consideration of the conservation and management requirements.

Registration and documentation of historic remains

In the first field season (January 2001) a sequence of 13 beaches were surveyed, located on the north-western coast of King George Island from the Bell Point Glacier, starting from the east to Fuschloger Beach, close to the northern extremity of the President Frei airport.[4]

In the second field season (January 2002) surveying of the peninsula was continued to the Collins Glacier near the Uruguayan base, Artigas. In total, 28 beaches were visited and 35 historic remains were doc-

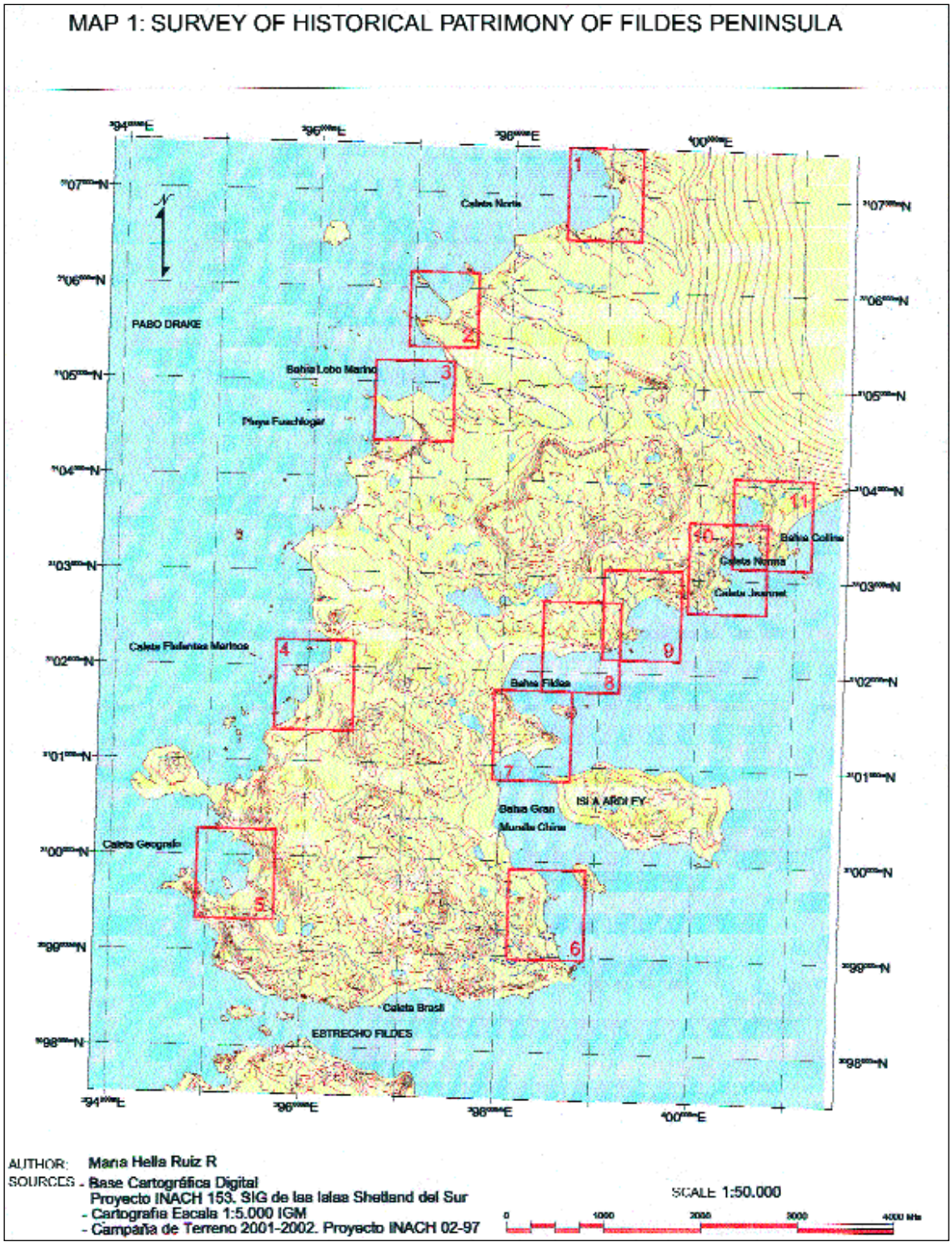

Fig. 2
Sites of discoveries of historical remains. Fildes Peninsula.

umented. [5.] All the beaches of the peninsula present differing degrees of human disturbance from the activities of four nearby scientific bases belonging to China, Russia, Chile and Uruguay. The survey of the eastern coast of Nelson Island opposite Fildes Peninsula was also started, with an examination of a total of nine beaches separated by glaciers.

To document the geographic location of the sites and other remains, the Global Positioning System (GPS) was employed together with mapping at a scale of 1:5,000. This permits precise positioning of all points of interest, speeding the field recording and the production of the corresponding cartography. Unfortunately digital cartography with this level of detail is only available for two areas, Fildes Peninsula and Cape Shirreff, contrasting with other areas where the precision of the maps is much worse.

The 11 insets of the map "Survey of historical patrimony of Fildes Peninsula" show expanded details of the areas and thematic maps detailing the beaches and the location of remains.

The concept 'historic remains' refers to both moveable and immovable cultural heritage materials of every period that are on the surface, except those actually in use. The immovable remains include structures made of stone, wood and metal as well as inhabited rock shelters. These were documented independent of their condition, which is generally very poor. The wooden structures have been blown apart by the wind and then scattered by natural forces so it is difficult to recognize the original layout of the site. Sometimes minimal excavations were made, only when necessary to obtain diagnostic samples to ascribe the cultural and temporal context of the site. The moveable cultural heritage comprises ships' spars, timber, bottles and pottery that have the same characteristics as the wooden structures, scattered by wind and water.

The archaeological findings made to date in this second phase of the systematic survey can be summarised as follows.

Beach No.	Type of Remains	Beach No.	Type of Remains
		15	Glass bottle
2	Timbers	16	Big spars
3	Timbers and spars	17	Occasional shelter
6	Brick foundation	20	Fireplace
6	Stone structure	20	Fireplace
8	Rock shelter	21	Rectangular stone structure
8	Stone structure	23	Fireplace
8	Timbers	23	Rock shelter and fireplace
10	Stone structure	23a	Fireplace
11	Stone structure (Photo - Fig. 1)	23a	Fireplace
12	Stone structure	24	Rock shelter and fireplace
13	Timbers and spars	25	Biomonitoring stations
14	Fireplace	25	Rectangular stone structure (Fig.3)

Regarding conservation, there are both natural and human factors that affect the remains or that can soon cause damage. In the first case the principal agents are the wind, water (in the form of snow, ice, rain and high tides), stones eroding from cliffs, and the presence of wildlife (sea mammals and birds). These natural factors affect each remains in different ways and intensities, so each has to be evaluated independently.

Regarding the human factors, Fildes Peninsula has four different scientific bases each from a different country, as well as an airport and naval installation. Increasing numbers of military personnel, scientists and tourists carry out activities in the area causing pressure on the historic sites. The precarious character of the remains, their low visibility and the lack of information regarding their position means they can easily be destroyed in ignorance. Thus it is necessary to develop preventive strategies.

Surveying around three of the bases revealed an absence of historical remains, with the exception of Artigas Base that intentionally protects shipwreck remains. This suggests that the construction or operational period of these bases could have destroyed heritage materials. In connection with this idea, it is interesting to

Fig. 3
Rectangular structure from post-1950s. (Beach 25)
(Ruben Stehberg)

note that the best-preserved and earliest remains are found furthest from the bases. However, it is possible to see biomonitoring stations, contemporary refuges and vehicle tracks crossing very close to the latter historic sites.

There is an urgent need to design a conservation and management plan for the sites, that respects their protection yet permits the continuity of the scientific research and the tourist aspects as well. To this end there are three lines of activities under development. The first is the publishing of the historical remains with a brief description and a cartographic emphasis (with the purpose of avoiding further damage to the sites). The second activity is the proposal for a conservation, management and administrative plan for these Antarctic historic sites, in collaboration with Australian specialists [6]. However, this program is experiencing difficulties caused by the economic crisis affecting the Chilean Antarctic operators (Chilean Air Force and Chilean Navy) and the translocation of the Instituto Antartico Chileno to Punta Arenas. We hope that in the next few years these problems will be solved and that we will continue the program.

The third activity was our incorporation as a member of ICOMOS Chile and later as Chilean representative to the International Polar Heritage Committee (IPHC) to contribute with our experience on the South Shetland Islands and to use this to assist international development for the identification and protection of Antarctic historic sites.

Footnotes

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6 Dr. Michael Pearson. Director of Heritage Management Consultants Pty Ltd. and Janet Hughes, who have been involved in the conservation of Mawson's hut.

DUTCH CULTURAL HERITAGE IN THE ARCTIC

Louwrens Hacquebord

Introduction

In the 19th century Dutch geographical names disappeared more and more from the maps of the Arctic. The Netherlands was not the important seafaring nation of the 17th and 18th century any longer, and other countries took over that position with obvious consequences. The members of the Netherlands Geographical Society called this situation alarming. They were not only worried about the disappearance of the Dutch geographical names, but also about the condition of the Dutch monuments and sites in the Arctic. And they had good reason to be concerned. In 1871 the discovery of the wintering site 1596-97 of the Dutch explorer Willem Barentsz on the northeast coast of Novaya Zemlya by the Norwegian seal hunter Elling Carlsen resulted in a complete plundering of the site. This looting caused a great deal of fuss in the Netherlands when the 16th century objects were offered for sale at the market in Hammerfest, northern Norway. Fortunately a British tourist, Ellis C. Lister Kay, bought the whole collection of historical objects and resold it to the Rijksmuseum in Amsterdam some time later. Very soon the so-called Novaya Zemlya objects became the relics of the Dutch exploration history in the permanent exhibition of the Museum (de Jonge 1872).

Some years later tourists and other visitors to Amsterdam Island in the northwest corner of Svalbard disturbed the graves of Dutch 17th century whalers there, taking away the wooden crosses and sometimes even the skulls as souvenirs. This caused such a commotion in the Netherlands that the Queen of the Netherlands personally sent a man-of-war ship to restore the graves in this no-mans land. This probably was one of the main reasons why the Dutch government insisted on an international decision about the sovereignty of Svalbard in the beginning of the 20th century.

Despite these early threats there are still monuments and sites in the Arctic with a Dutch cultural origin. They are good examples of the so-called “visitor heritage” and are often “foreign elements” in the national area where they are found. The monuments and sites are worthy of conservation not because they are Dutch cultural heritage, but because the sites belong to the entirety of polar cultural heritage.

The wintering site of Willem Barentsz

During his discovery of the site where Willem Barentsz and his companions wintered, Elling Carlsen not only collected objects but fortunately also made a description of the context in which he found them. The house he found at 76°15' N and 68°18' E was built of driftwood and wood from the ship. The measurements of the Behouden Huis, as this house was called in the Dutch historical literature, were approximately 6.3 x 10 m (de Jonge 1872). Based on Carlsen’s information Dr A.H. Petermann made a drawing of the house as it was found. This drawing makes it very clear that the house was built as a log cabin with ship planks on the upper part of the walls and a chimney in the central part of the house.

The history of the site after discovery is very interesting (figure 1). The site was plundered several times. Already in 1875 captain Gundersen visited the place and also he collected some objects. In 1876, encouraged by the Dutch explorer Laurens Rijnhart Koolemans Beynen, the Englishman Gardiner visited the place and also he took some objects with him. In this way an impressive number of objects was taken away from the site. As far as we know Miloradovic of the Arctic Institute in St. Petersburg was the next person to visit the place in 1933. He found out that only a few remains were left of Barentsz’ house. He collected some objects in the surroundings of the house and brought them to the Arctic and Antarctic Museum in St Petersburg. After Miloradovic, Dimitri Kravtsjenko visited the wintering place in 1977, 1979 and 1980. He made some field drawings in which he put in house remains and the remaining objects (Kravtsjenko 1981), and also placed a big cross at the site. We do not know of anyone visiting the site after Kravtsjenko, but the objects from Novaya Zemlya in the Polar Museum in Tromsø, northern Norway, show that certainly more visitors must have been there plundering the site. In 1992 for the first time Dutch scholars landed on the site north of Mys Sporyy

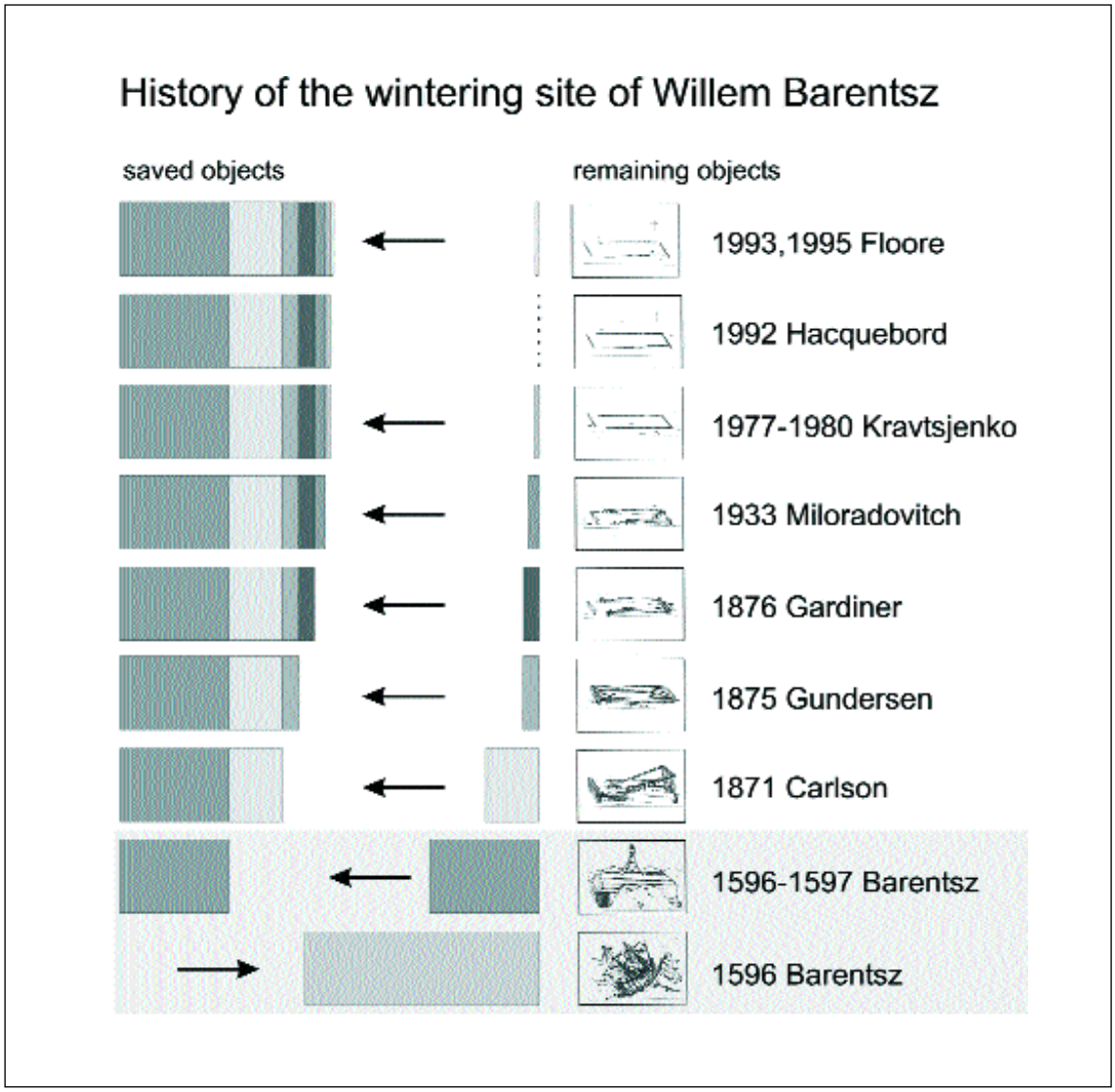

Figure 1. The history of a site. (H.J. Waterbolk/ F. Steenhuisen)

Figure 2. The wintering site of Willem Barentsz on Novaya Zemlya, Russia. (Louwrens Hacquebord)

Navolok to investigate the remains of the Behouden Huis (Hacquebord 1995). This expedition from the Arctisch Centrum of the Rijksuniversiteit Groningen discovered that almost nothing was in situ any more, so that an archaeological excavation was useless (figure 2). In 1993 and 1995 excavations by the University of Amsterdam gave the site its coupe de grâce. Nowadays only the Kravtsjenko cross, the four replaced beams of the house and a memorial plaque from the community of Terschelling, The Netherlands, indicate the place where Europeans managed to survive the polar winter for the first time in history. Although the site was disturbed several times, it is still an important monument to polar exploration history.

Smeerenburg on Amsterdam Island, Svalbard

Another famous Dutch site is the place of the former Dutch whaling settlement Smeerenburg on Amsterdam Island (79°45' N, 11°02' E). Smeerenburg was a 17th century settlement constructed in the Dutch architectural tradition and built totally of materials brought from The Netherlands.

Parts of Smeerenburg were excavated by a Dutch/Norwegian archaeological team in 1979, 1980 and 1981 (Hacquebord 1984). These excavations were very successful and produced much information about the early western European whaling activities. It showed that this settlement was composed of seven whaling stations. It was the headquarters of Dutch whaling along the coast and in the bays of Svalbard (Spitsbergen). The first butchering and boiling activities on Amsterdam Island were done by whalers from Amsterdam under the command of Willem van Muyden in 1614. In 1619 the people from Amsterdam built the first wooden houses on the southeast point of Amsterdam Island. Later also whalers from Hoorn/Enkhuizen, Delft/Rotterdam, Veere/Vlissingen, Middelburg and even from the Danish King Christian IV founded a whaling station in Smeerenburg. In this way the settlement grew in size. The excavations showed that in its hayday Smeerenburg consisted of six double furnaces, one single furnace and sixteen houses (figure 3). The village had a blacksmith's shop, a bakery, a bottling-room and a small stone-walled fort. In this settlement there was accommodation for approximately 200 people who butchered the whales caught in the surrounding waters and boiled the blubber into whale oil.

Smeerenburg was built on an excellent site. It was a very good anchorage for the whaling ships and its sandy beach was a natural slipway where the killed whales could be pulled ashore. Above all there were many whales in the bays in the area in the beginning. The settlement was deserted in the early 1650s (Hacquebord & Vroom 1988). Whaling continued but the blubber was boiled in the Netherlands.

Smeerenburg is an excellent example of the early western European whaling trade. It shows how

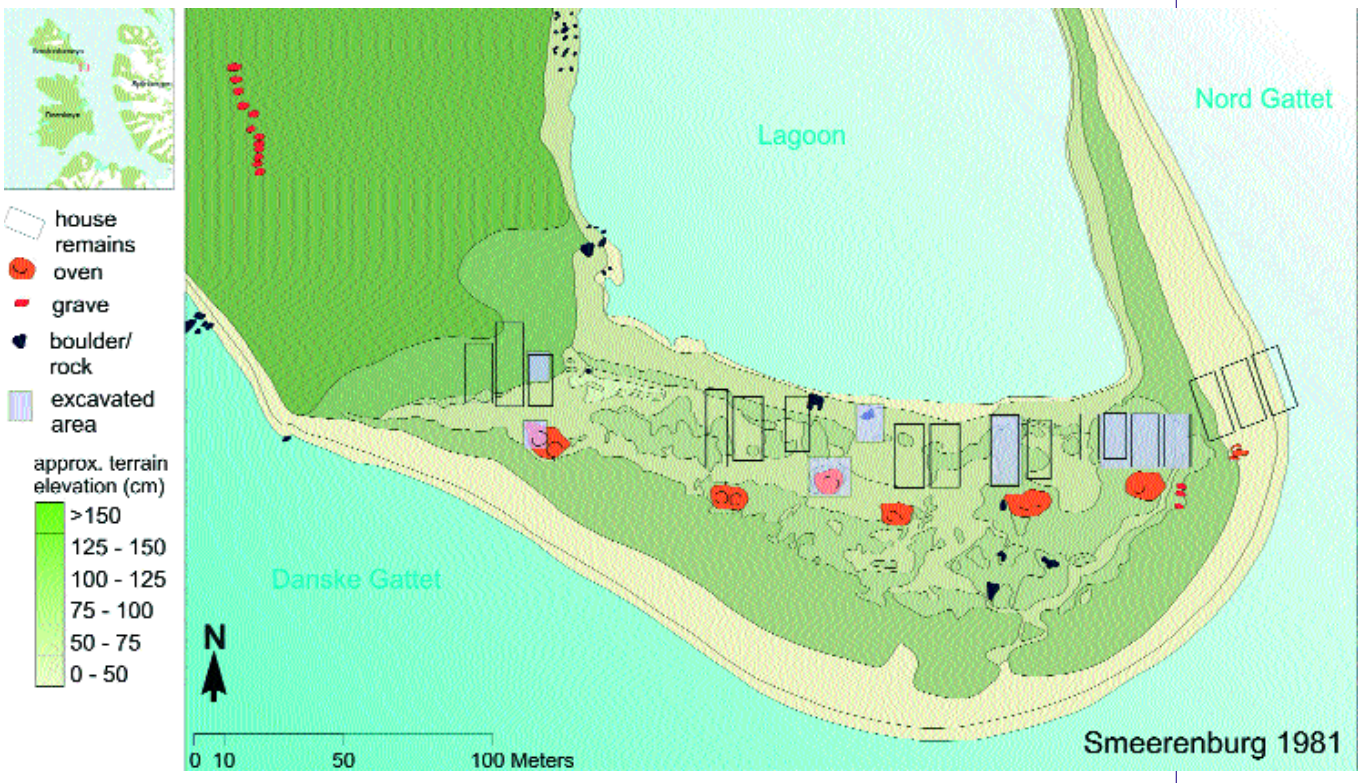

Figure 3. The site of Smeerenburg, Amsterdam Island, Svalbard. (W. Zweers/ J.K. Kwadijk/ F. Steenhuisen)

Kvalrossbukta, Jan Mayen where the last traces of the waling station can be seen in the slope face. (Susan Barr)

countries like The Netherlands and England developed their whaling activity, based on Basque tradition, from temporary arrangements like tents with provisional ovens into permanent stations. The permanent stations had houses made of wood and bricks, and furnaces of stones and brick with chimneys to create a draught. Today, after four hundred years, the remains of such furnaces and houses are still visible on the Smeerenburg spit of land, making the ruins of the settlement the most important monument from the organized western European whaling in the Arctic.

However, the visits by tourists and others put a lot of pressure on the site. Groups of sometimes more than fifty persons walk over the site, not only eroding it, but also destroying the archaeological archive under it.

In the neighborhood, higher on the island, there are two big graveyards. Altogether 89 graves are still visible. Most of the graves were already disturbed by tourists at the end of the 19th century, as mentioned above. The sailors from the man-of-war *Hr Ms Friesland* that the Queen of the Netherlands sent in 1906, did their work on the graves so thoroughly that almost no graves exist any more. The mortal remains were put into a mass grave the sailors dug on the north side of the island. With the wood from the coffins and stones from the surroundings the sailors built a monument on the mass grave on which they placed a memorial stone with the text: *Hr. Ms Friesland herstelde deze graven in 1906 op last van de Koningin der Nederlanden* (Hr. Ms. Friesland restored these graves by order of the Queen of the Netherlands in 1906). Beside their stone the sailors placed the memorial stone from the crew of the schooner *Willem Barents*. This stone was placed on the island in 1878 and has the text: *In Memoriam. Spitsbergen of Nieuland ontdekt tot 79º 30´ n.breedte door de Hollanders. Hier overwinterden 1633-1634 Jacob Segersz en zes anderen, hier overwinterden en stierven 1634-1635 Andries Jansz van Middelburg en zes anderen.* (In Memoriam. Spitsbergen or New-land discovered till 79 30 North by the Dutch. Here wintered 1633-1634 Jacob Segersz and six others, here wintered and died 1634-1635 Andries Jansz van Middelburg and six others). In the neighborhood of Smeerenburg near the lagoon the remnants of the grave of the seven men who died during the wintering of 1634-1635 was found in 1980. Not much of the grave was preserved. Only the bottoms of seven coffins with some bones were excavated. After the excavation the grave was closed and marked with a circle of stones.

Other whaling sites in the northwest corner of Spitsbergen

At several other places around northwest Spitsbergen the remains of furnaces and sometimes also houses were found. On the other side of the Danish bay from Smeerenburg, in Virgohamna on Danish Island, the remains of three double furnaces exist. Behind the middle furnace the remains of five houses are visible. These remains are from the whaling station of the Frisian whaling company from Harlingen and Stavoren called *Harlinger traankokerij*. It operated from 1636 till 1662. This whaling station is situated on a very busy spot. Due

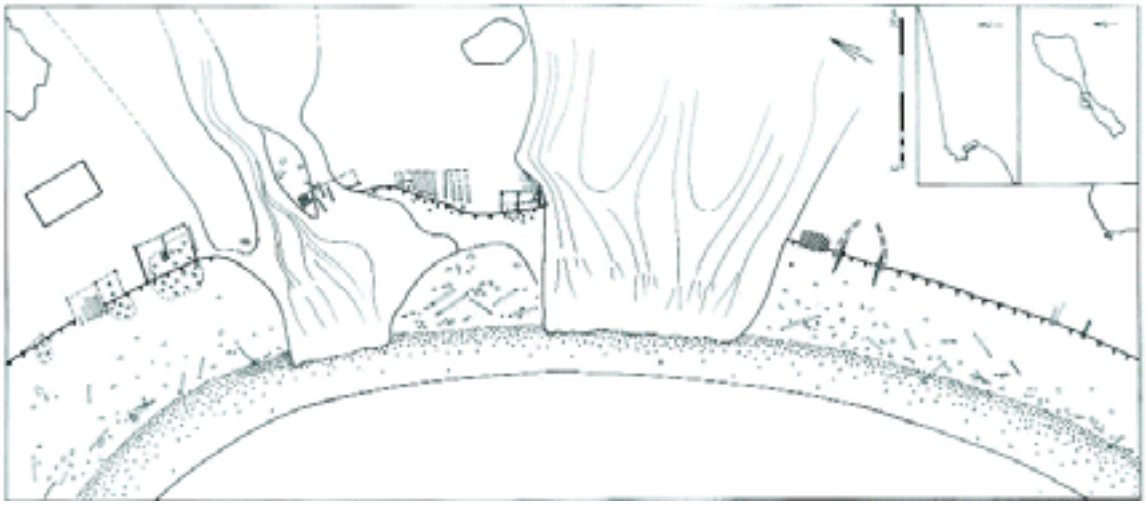

Figure 4. Remains of the 17th century Dutch whaling stations in Kvalrossbukta on Jan Mayen in 1983. (L.Hacquebord/ H.J. Waterbolk)

to some well-known expeditions trying to reach the North Pole – Andrée's 19th century balloon expedition and Wellman's activities in the beginning of the 20th century – the site is visited by many people. Most of them do not know about the whaling remains at the same place. East of the furnaces eight graves are found and two graves were found in the furnaces. They all belong to the whaling period.

On Ytre Norskøya ten furnaces, three double and seven single, were found on the south beach of the island. The bay of Ytre Norskøya is an excellent harbour which is very well protected against northern winds. Many whalers must have visited the place after a rough voyage. Behind the furnaces the remains of probably four houses were found (Hacquebord 1984). On the west side higher on the island a big graveyard with 184 graves was found. In 1980 fifty of these graves were excavated to get more information about the health and causes of death of the people (Maat 1984, 1988). Until recent years the place was not visited very often, thanks to its remote location, and the cultural heritage was rather well protected.

Whaling stations on Jan Mayen

On the beaches of some western bays on the Norwegian island of Jan Mayen more remains of 17th century Dutch whaling stations can be observed. These remains were found at three different places, but were most clearly visible in the Kvalrossbukta (70º58' N, 8º41' W), the former *Noordbaai.* (Hacquebord 1998).

In various places in Kvalrossbukta planks protrude from the surrounding slope and brick fragments colour the black sand yellow. Sometimes however, the beach here yields up more objects than these planks and bricks. This happens when storm waves erode the slope edge many meters inland. After such an event the beach is littered with objects which reveal something about the daily life in a 17th century whaling station. In the building of the radio station on Jan Mayen is a showcase with objects found on this site. In the courtyard of the station two guns and an anchor from the same site are exhibited. These objects tell the story of the 17th century whaling activities on and around the island.

According to descriptions from 19th century visitors and pre-war pictures of the bay, a big part of the settlement has been washed away by the sea during the past hundred years. The furnaces have been totally washed away and only the rear parts of some of the houses still exist, sometimes covered by mud from the mud streams coming from the slope (figure 4). Already in the 17th century whalers complained about the mud streams which had destroyed their houses in this bay.

Two archaeological surveys in 1983 and in 1988 demonstrated that the slope edge is moving rather fast inland. Soon no remains of the Dutch whaling stations will be left anymore in the Kvalrossbukta. The time has come to decide what to do with the Dutch cultural heritage on Jan Mayen.

Behind the remains of the Dutch stations a memorial stone was placed by the crew of the Dutch man-of-war *Hr. Ms. Nautilus* in 1930 with the text: *Outgert Jacobsz van Grootebroek en zijne 6 Hollandsche makkers zijn in april 1634 hier bezweken bij eene poging tot overwintering* (Outgert Jacobsz of Grootebroek and his 6 Dutch companions died in April 1634 during their attempt to winter here). On the Rekvedsletta in the Kvalrossbukta a burial mound, called Hollendarhaugen, with two crosses is probably is the place where the winterers were buried.

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