British Antarctic Survey

Halley Research Station

British Antarctic Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Halley V

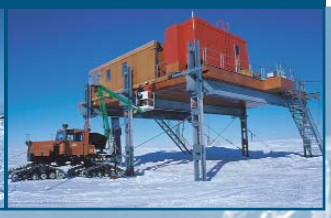
Halley V took six years from being conceived at the drawing board to its commissioning in February 1992. It is novel in that the three main buildings sit 4 m above the snow on independent jackable steel platforms. The largest is the Laws Building (accommodation) which is 59 m long, 14.6 m wide and 3 m high. The smaller Simpson Building (meteorology and ozone studies) and Piggott Building (upper atmospheric sciences) house specialist laboratories. The height of the platforms above the ice shelf affects the local wind turbulence and the build-up of drifting snow. Each summer the platforms are raised an average of 1m to compensate for the accumulated snowfall. In addition, the supporting legs can be realigned to correct for distortion caused by differential movement in the flow of the ice shelf beneath.

The Station

The **Laws Building** comprises three sections, a services/technical support area, living area and sleeping quarters. Diesel engines provide electrical power and their waste heat warms the buildings and melts snow to provide water. The living area includes a darkroom, lounge, library, dining room, kitchen, computer room, base commander's office, communications room, recreation room, storage areas, washrooms, a hospital and a surgery. There are 20 two-person bedrooms. The winter station complement ranges from 14 to 18 and includes scientists, support staff and a doctor. Summer visitors are accommodated in the **Drewry Building**, a self-contained building on skis that is towed to a fresh site each year to avoid burial, and also serves as an emergency refuge. The **garage** was the first building to be built at Halley using this ski design.

The Laws Building

The Piggott Building



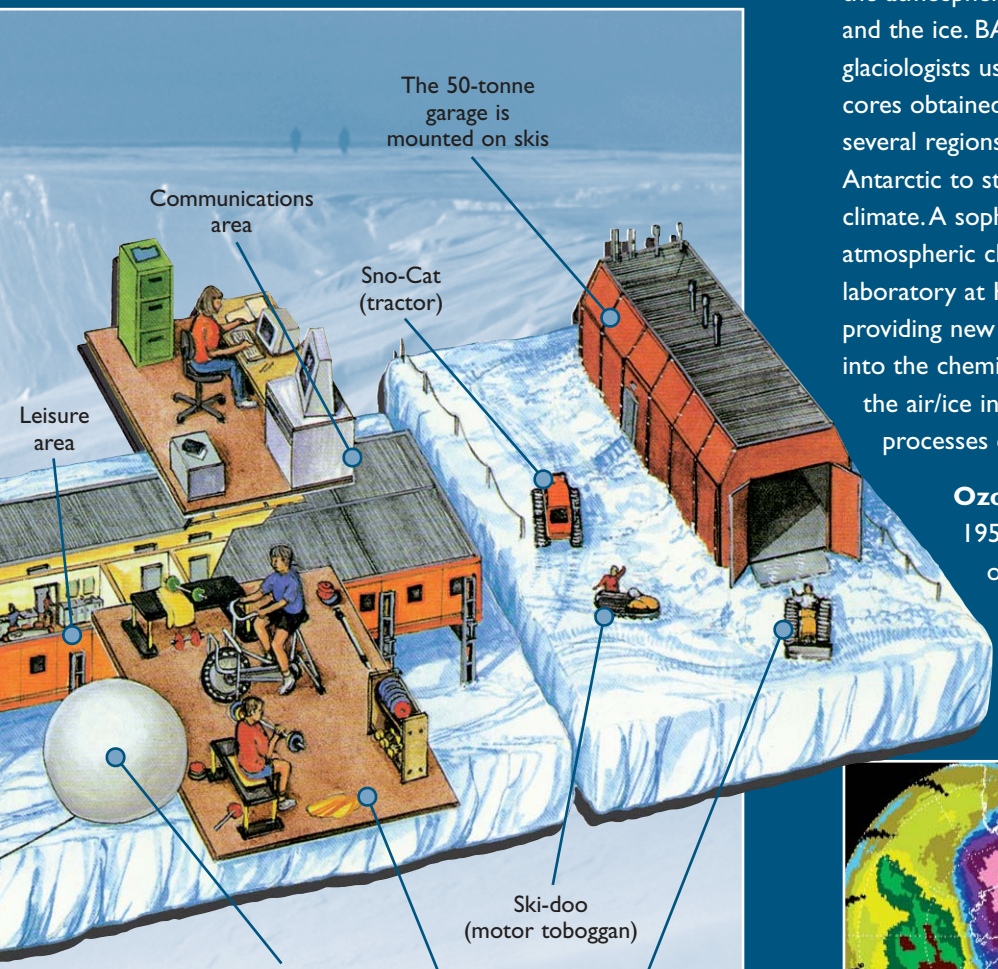
Climate, Ice and Ozone Studies

Studies at Halley station are crucial for a global perspective on ozone depletion, atmospheric pollution, sea level rise and climate change.

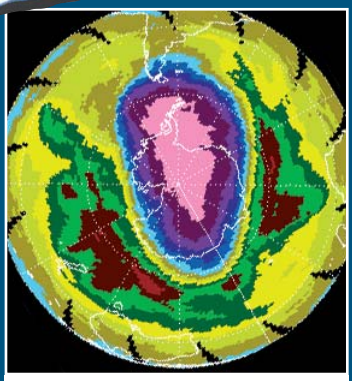
Meteorological data has been collected since 1956, together with a dozen other stations in East Antarctica it provides a climatic database for an area larger than Europe. The data, sent by satellite to weather forecasting centres in the northern hemisphere, has an immediate use. However, the database is also vital for informing all aspects of climate change research. The flatness of the ice shelf provides one of the best natural laboratories in the world for studying the dynamics of the atmosphere close to the ground. This is used to improve the representation of high latitude processes in General Circulation Models used for climate modelling. It also provides a link between the atmosphere and the ice. BAS glaciologists use ice cores obtained from several regions of the Antarctic to study past climate. A sophisticated atmospheric chemistry laboratory at Halley is providing new insights into the chemistry of the air/ice interface, levels of pollution and a range of processes critical for interpreting ice core data.

The Clean Air Sector Laboratory (CASLAB) is used to study snow and air chemistry and is located nearly 2 km from the main Laws building

Balloon launched radio-sondes provide meteorological data for forecasting



Ozone has been monitored at Halley since 1956. A spring-time depletion in stratospheric ozone was discovered by BAS in 1985, and this led very quickly to the international response to curtail production of Chlorofluorocarbons (CFCs). Halley lies under the ozone hole and monitors key chemical constituents of the stratosphere.



Ozone and other chemical species of the stratosphere are monitored *(Courtesy NASA)*

Geospace Research

The near-Earth region of interplanetary space (called Geospace) is dominated by the interaction of the Sun's atmosphere with the magnetic field of the Earth. Understanding the physics of geospace is of increasing importance. Periodic increases in solar activity create magnetic storms that affect a wide range of technical systems on satellites, impact radio communications and power-line transmission. Halley, lying at the edge of the southern auroral zone, is ideally situated for **geospace research**. A suite of powerful radio, magnetic and optical instruments, including the Southern Hemisphere Auroral Radar Experiment (SHARE) radar, provide a comprehensive picture of the consequences of solar activity in the upper atmosphere (above 100 km). Instruments monitor an area of around three million square km of geospace above the South Pole. Halley is also the focus of the BAS Low Power Magnetometer (LPM) network, a suite of ten unmanned monitoring stations distributed between Halley and the United States South Pole station, which also contribute to geospace research.

The aurora in winter over Halley

At around 85 km, the mesosphere is the coldest part of the Earth's atmosphere and is at the boundary between geospace and the stratosphere. This region has long been inaccessible to instrumentation but Halley now has a suite of state-of-the-art radio and optical instruments for observing the mesosphere's temperature and wave activity. This instrument suite completes the ensemble at Halley and allows the Earth's atmosphere to be studied from ground level to its very outer limits.

Halley station provides sophisticated computing and digital communication facilities. This is crucial for BAS operational requirements as well as enabling participation in numerous international scientific programmes and international data gathering activities such as the world meteorological network.

The SHARE Antenna

History of Halley Station

Halley I (see opposite) ▶

Halley II **was built in 1967 and was closed in 1973 ▼**

Halley III **was a series of prefabricated huts housed inside corrugated steel tubes and was occupied from 1973-84 ▼**

Halley IV **comprised of two-storey huts housed inside tubes constructed from interlocking plywood-faced panels. It was occupied from 1983-1992 ▼**

Buildings built on the moving ice shelf, ▲ eventually become buried by snow and break off in icebergs. This is Halley III emerging from the edge of the ice shelf

Halley V is the fifth station to be built on the Brunt Ice Shelf, Coats Land. The first was established in 1956 by the Royal Society for the International Geophysical Year (IGY), 1957-1958, and named after the astronomer Edmond Halley.

The Royal Society base at Halley Bay, established for International Geophysical Year. This station eventually became buried by snow and was closed in 1968

The station filled an important gap in the IGY Antarctic network with studies in meteorology, glaciology, seismology, radio astronomy, ionospheric physics, aurora & airglow, and geomagnetism. Many of these studies have continued uninterrupted since 1957.

The extreme environment of the Brunt Ice Shelf poses great technical problems to builders with blizzards and snowdrift eventually burying everything. Buildings disappear beneath the snow, requiring ever-lengthening vertical shafts to provide access to the outside world. Because of burial by snow and movement of the ice shelf it was necessary to replace and re-site the first Halley station in 1967, and subsequent stations in 1973, 1983 and 1992; all being abandoned before being crushed by the weight of overlying snow.

Halley Research Station is re-supplied by ship once during the Antarctic summer. Cargo is normally off-loaded onto sledges on the sea-ice, and towed by tracked vehicles up ramps of drifted snow onto the ice shelf and 12 kilometres inland to the station.

At times, lack of a suitable snow ramp has lengthened the re-supply route from the ship to the station to 60 km. 24 hours of daylight allow cargo-work to continue around the clock.

A Sno-Cat hauls supplies from the ship to the station across sea ice

The **British Antarctic Survey** (BAS), part of the Natural Environment Research Council, undertakes a world-class programme of scientific research, and sustains for the UK an active and influential regional presence and a leadership role in Antarctic affairs.

Based in Cambridge UK it has, for almost 60 years, conducted Britain's scientific research on and around the Antarctic continent. Around thirty countries have research stations in Antarctica.

BAS employs over 400 staff and operates three stations in the Antarctic, at Rothera, Halley and Signy, and two stations on South Georgia, at King Edward Point and Bird Island. The Antarctic operations and science programmes are executed and managed from Cambridge and rely on a broad mix of professional staff.

Ice-strengthened ships sustain the Antarctic operations. RRS *James Clark Ross* has advanced facilities for oceanographic research. RRS *Ernest Shackleton* is primarily a logistic ship used for the re-supply of stations. Four Twin Otter aircraft fitted with wheels and skis are operated from Rothera and Halley, while a wheels-only Dash-7 aircraft provides the inter-continental air link from Rothera to the Falkland Islands and flies inland to blue-ice runways. Valuable logistic support is provided by the Royal Navy's Ice Patrol Vessel, HMS *Endurance*, and its helicopters.

The BAS research programme is planned on a five-year timetable.

For more information about British Antarctic Survey visit ***www.antarctica.ac.uk***

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