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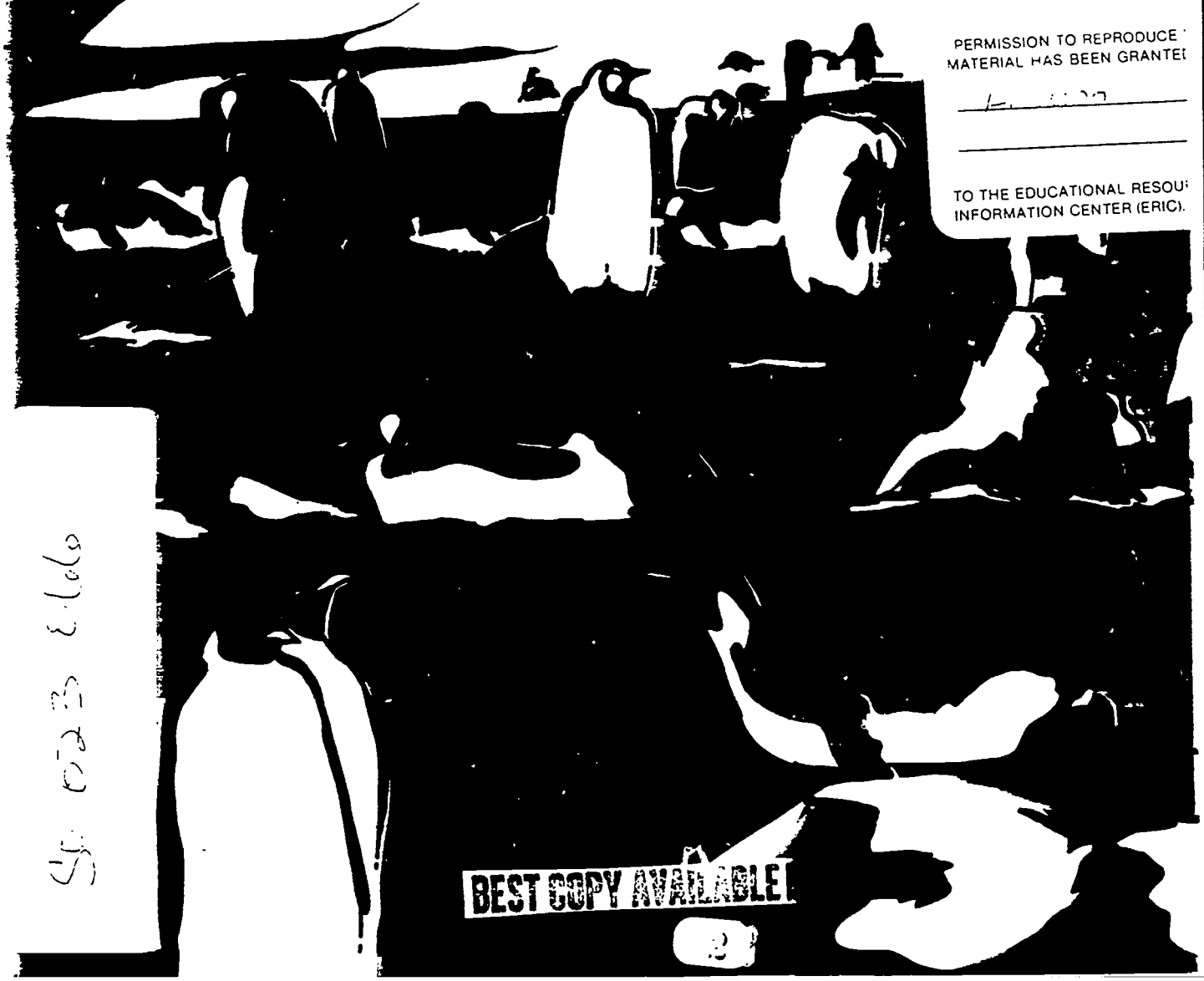
ABSTRACT

In 1980 the members of the Pacific Circle Consortium (Australia, New Zealand, the United States, Japan, and Canada) considered a proposal from the Tasmanian Education Department for a project to develop a curriculum framework and teaching materials about the Antarctic. The outcome was the Antarctic Project conducted jointly by Australia and New Zealand with participation from Tasmania and the Curriculum Development Center of Canberra, Australia. This document provides background on the Antarctic Project and development of the materials, explaining the Project's "resource-led" approach and its conceptual base. A resource-led approach implies that the materials are not a course of study, but are designed to be capable of incorporation into classroom situations and to stimulate students interest and awareness of the Antarctic. Among the concepts that occur throughout the materials are challenge, survival, and dependence. The materials developed under the Antarctic Project are discussed in detail and include both teacher materials such as "Antarctica: Discovery & Exploration" and student materials such as "The Adventures of Salik the Husky." Practical suggestions for classroom approaches to teaching about the Antarctic are given including sections on preparatory learning and examples of three approaches: a cross-curricular approach for younger learners, a 2- to 4-week modular approach for middle grades, and an approach for secondary students involving teaching the materials within a social sciences curriculum or as a unified short course. A copy of the Antarctic Treaty, a bibliography and resource list, including films and other visuals, and a simple outline map of Antarctica that can be reproduced for classroom use also are included. Numerous photographs illustrate the text. (DB)

Teaching and Learning about ANTARCTICA



Teaching and Learning about

ANTARCTICA

A TEACHER'S GUIDE

Curriculum
Development
Centre
Canberra
Australia

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Contents

Introduction: about this book

"Teaching and Learning About Antarctica" provides background on the Antarctic Project and development of the materials, explaining the Project's "resource-led" approach and its conceptual base. It lists the materials in detail, and gives practical suggestions for classroom approaches to teaching about Antarctica.

These include sections on preparatory learning and examples of three approaches: a cross-curriculum approach for younger learners, a two to four-week modular approach for middle grades and an approach tailored for secondary students within a social sciences curriculum or as a unitised short course.

Also included is a copy of the Antarctic Treaty, a bibliography and resource list, and a simple outline map of Antarctica which can be reproduced for classroom use.

In the Taylor Dry Valley.

Antarctica has been called a white desert.

Antarctica: unique opportu nity for learning

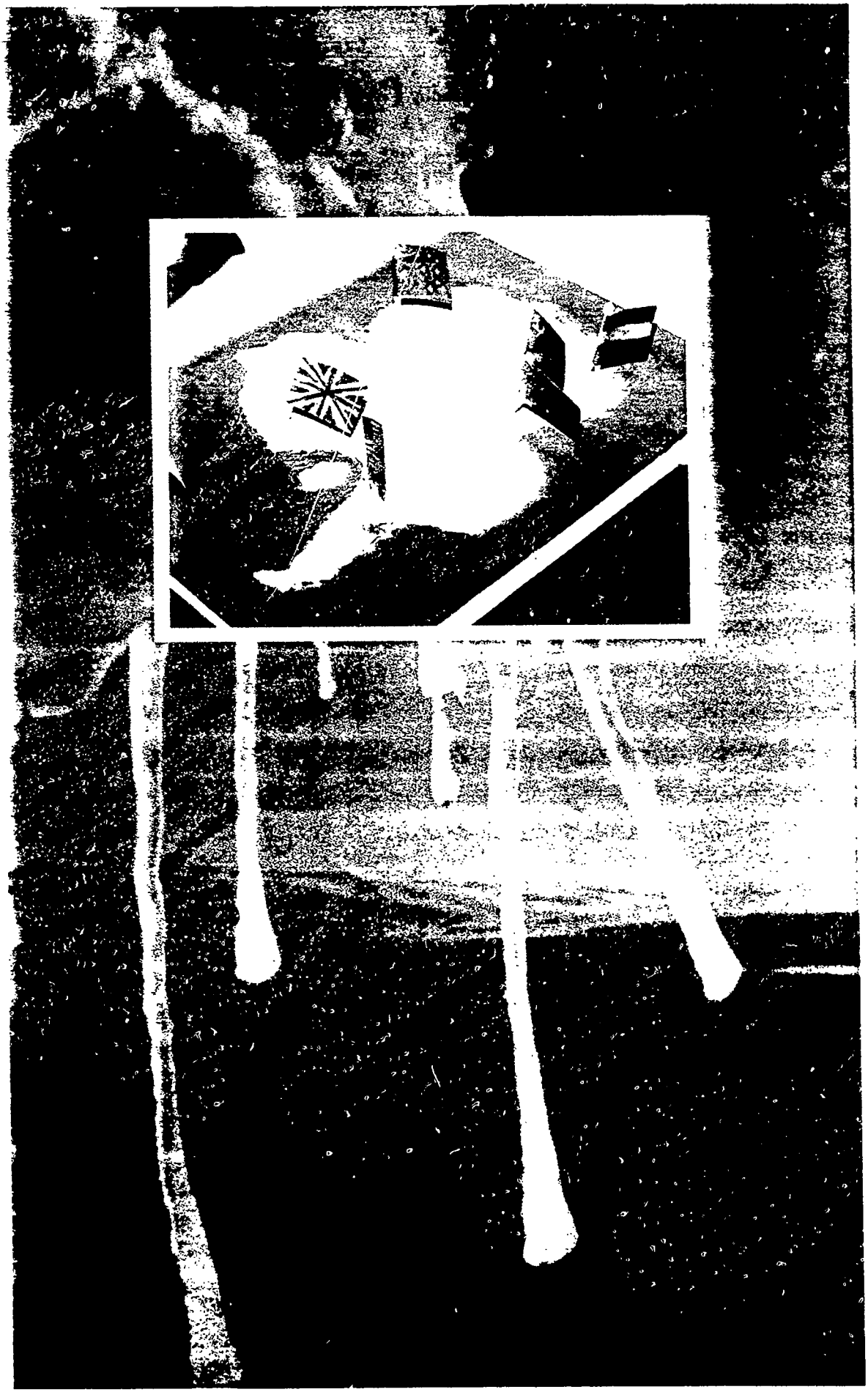
"This last great continent lures the adventurers, fascinates the enquirer and humbles them all".

Antarctica is one of the few remaining frontiers. The environment and the human activity associated with it provides perspectives that are distinctly different. This creates special opportunities for learning.

There are many reasons for studying Antarctica. It is a key element in the world's climate. Some of the secrets of the earth's past are locked beneath its icecap. It has a fascinating physical environment and a unique and fragile ecosystem. It is a frontier of scientific research and technological development.

Antarctica is unique and its history is an important and dramatic story of discovery and exploration. This story is sometimes inspiring, sometimes tragic, but it has much to teach us about how people react under extreme conditions and how they can live with each other and their environment.

The Adelie penguins emerge from their winter quarters on the drifting pack ice



Developing the learning materials: an international perspective

In 1980 the Pacific Circle Consortium (whose members are Australia, New Zealand, the United States, Japan and Canada) considered a proposal from the Tasmanian Education Department, supported by the Curriculum Development Centre, for a project to develop a curriculum framework and teaching materials about the Antarctic. The Pacific Circle countries seek to improve teaching about the Pacific Ocean and the people and countries who border it.

The Tasmanian proposal outlined the need for development of material on Antarctica and the Southern Ocean. The proposal was accepted and the outcome was a joint Australia-New Zealand project with participation from Tasmania, New Zealand and the CDC.

The Pacific Circle Consortium believes that educational materials are most valuable when developed jointly, reflecting interests, issues and concerns that extend beyond national boundaries. For New Zealand and Australia, Antarctica is the Near South. Both countries (along with two other Pacific Circle members, Japan and the United States) are original signatories to the Antarctic Treaty. In that treaty, the nations recognised that it was in the interest of all the human race that Antarctica should forever be used only for peaceful purposes, and that freedom and international co-operation in scientific work in Antarctica would contribute to science and the progress of humanity.

Murray Yaxley of the Tasmanian Education Department was appointed project officer and began the task of finding out what was currently available. From the beginning of the project, it was recognised that teacher involvement was central to the success of the venture and that teacher-made prototype ideas and materials would feature prominently. Teacher groups were formed in Tasmania and New Zealand and the assistance of people with field experience in the region was actively sought. The Antarctic Divisions of government on both sides of the Tasman were very co-operative and provided up-to-date information unavailable elsewhere. Technical advice and photographs were freely given by university departments, libraries, museums, administrators and expeditioners.

A study of the literature suggested that there were four major areas which came within the ambit of the Antarctic Project: social sciences, concerned with the history and geography of the area and the complex organisational and political considerations involved in the unique Antarctic community; marine sciences, the nature of the vast Southern Ocean and the life within it and the use of these resources; earth sciences, dealing with the features of the great southern land and ice mass; and technology, which plays a central role in humankind's ability to survive in and manage the resources of the region.

Adelie penguins

Trialling was undertaken by schools in Hobart, Christchurch and Brisbane. Teachers and students offered plenty of constructive criticism but, more importantly, found the whole topic fascinating. The trial materials were then revised, re-designed and published in module form, keeping unit costs to schools reasonable and allowing flexibility in classroom use.

The members of the Pacific Circle recognise that the conservation and protection of the pristine Antarctic environment is vital. The wise international use and management of Antarctic resources will present many challenges that the world community will have to face and overcome. It is hoped that students and teachers will gain greater understanding, as well as enjoyment, as a result of studying these materials. For the sake of the future of the whole world, the children of the Pacific must understand Antarctica, its problems and its importance.

An Adelie chick with mother

A resource-led approach

The Antarctic Project materials are not a course of study; nor do they provide a complete resource for the study of Antarctica. The fascination of Antarctica is that we are still learning about it. Consequently the incomplete and still emerging knowledge of this area encouraged the Project's developers to adopt a resource-led approach.

The Antarctic Project materials bring together accounts of phenomena, people, events, creatures and circumstances that:

- are capable of translation into classroom situations;
- contribute to students' learning;
- create an awareness of this vast area of the earth's surface;
- stimulate interest and curiosity in the Antarctic environment;
- provide insights into human motives, behaviour and endeavours; and
- encourage support for the principles of the Antarctic Treaty

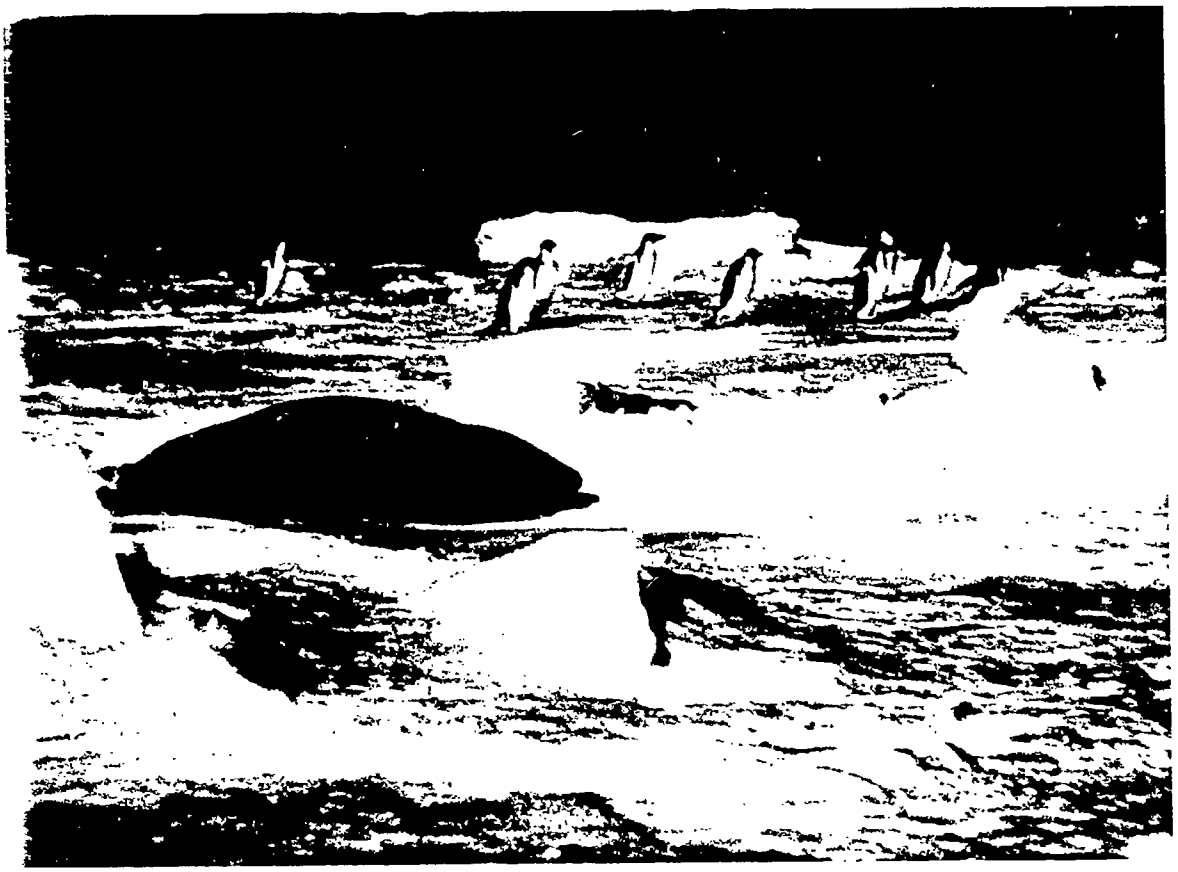
in a flexible package around which teachers can design appropriate learning sequences.

Attention has been paid to making an effective match between the characteristics of students, the conceptual nature of the material itself and the anticipated school contexts in which learning will take place.

The range of materials produced is extensive, from storybooks for lower primary grades to science-orientated modules for senior secondary students.

The materials can contribute indirectly to children's learning as an occasional reference, a private study or "reading for interest" material. They can also contribute directly to curriculum units or modules prepared by teachers in schools. They can supplement established courses of study in the social sciences, the sciences and the humanities.

Examples of class projects



Killer whale bursts through the ice

A conceptual base

Despite the diversity in the subject emphasis and the sophistication of the Antarctic Project materials, inter-related ideas and concepts occur throughout them.

Challenge: The mysteries of the Antarctic have challenged people in many ways. The drives to explore the unknown, to push oneself to the limit, to be the first, the fastest - common throughout history - are abundantly evident in Antarctica.

A cluster of related concepts include mystery, adventure, reward, discovery, fame, heroism, leadership, courage, endurance, determination and knowledge.

Survival: The harsh Antarctic environment is a continual threat to the survival of all living things. People have had to learn new ways to cope with the myriad of problems that frequently confront them.

Concepts such as adaptation, migration, seasonality, preparedness, planning, transport and technological innovation form a related cluster.

Dependence: The vulnerability of living creatures necessitates dependence - the need for assistance from one's own and other species.

Related concepts include food-chains, territoriality, co-operation, communication, community, conservation, management, responsibility and compassion.

Developing competencies

A recent development in curriculum thinking is the identification and teaching of competencies that are common to all areas of learning. The purpose is to give emphasis to more enduring skills and provide cohesion when the curriculum tends to become increasingly fragmented. The Antarctic Project materials provide an excellent opportunity to pursue the competencies outlined below.

Acquiring information

Listening accurately and critically to oral presentations; identifying the main ideas from print and graphic material as well as from other media.

Conveying information

Talking and writing for particular purposes; using a range of media to tell a story or present factual information.

Applying logical processes

Inferring from observations; analysing and interpreting information; solving practical and theoretical problems; forming hypotheses; anticipating and predicating consequences.

Undertaking practical tasks as an individual

Choosing, planning and organising a range of tasks, including those that require a degree of physical dexterity, and seeing them through to completion without supervision.

Undertaking practical tasks as a member of a group

Undertaking activities similar to those above with emphasis on co-operation, negotiation and leadership, which all involve the experience of being a contributor to a group effort.

Making judgments and decisions

Identifying alternatives, evaluating evidence and ideas, selecting appropriate courses of action.

Working creatively and solving problems

The ability to use ideas and materials inventively recombining ideas to meet new situations and contexts, and extrapolating beyond what has been given explicitly.

Acting autonomously

Displaying initiative, self-confidence and control and resilience.

Acting responsibly

Considering how actions will affect others as well as oneself; being tolerant or firm when appropriate; and valuing democratic processes and fundamental human rights.

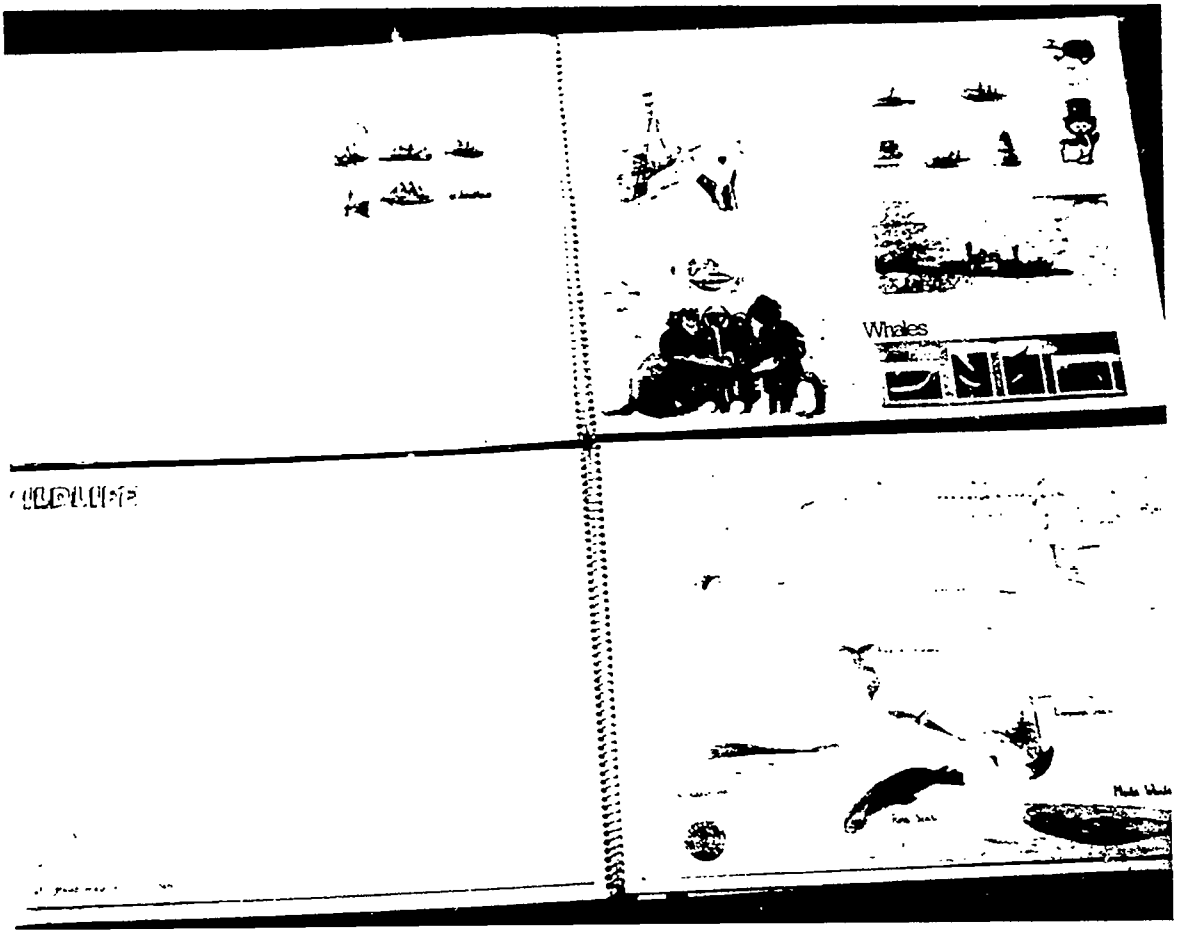
Showing care and concern for other people

Being sensitive to the thoughts and feelings of others; respecting different opinions and ways of doing things; being friendly and helpful.

Being concerned about values and beliefs

Examining how ideas and actions reflect beliefs; making moral judgements; and appreciating the values, rights and obligations of ourselves and others.

The comprehensive modules or units of work incorporated in this teacher's guide should be seen as sample approaches showing how the materials could be melded into a working program. Teachers should feel free to change and adapt the ideas and activities to suit their own individual class needs.



The Antarctic Project materials

The materials developed under the Antarctic Project can be used as both student and teacher resource books. Those particularly useful for teachers are detailed below.

1. Teacher reference materials

Teaching and Learning About Antarctica: a teacher's guide

Provides background on the Antarctic Project and development of the materials, explaining the Project's resource-led approach and its conceptual base. It lists the materials in detail, and gives practical suggestions for classroom approaches to teaching about Antarctica.

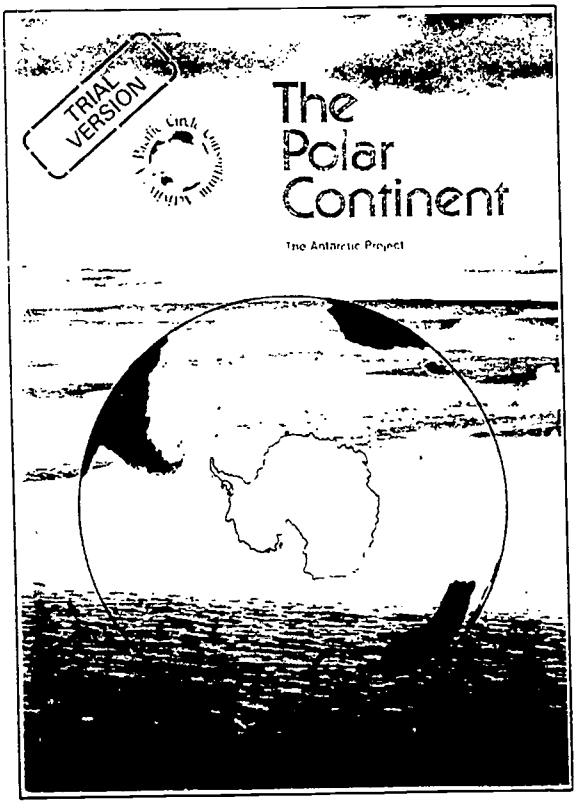
These include sections on preparatory learning and examples of three approaches: a cross-curriculum approach for younger learners, a two- to four-week module approach for middle grades, and an approach tailored for secondary students within a social sciences curriculum or as a unitised short course.

Also included is a copy of the Antarctic Treaty, a bibliography and resource list, and a simple outline map of Antarctica which can be reproduced for classroom use.

The Polar Continent

This book is an introduction to Antarctica designed as a reference to provide background information for teachers and students. "The Polar Continent" not only brings together and summarises some of the information available in detail elsewhere in the series; it also provides notes on some areas not covered by other Antarctic Project titles.

Subjects covered include geological history, the surrounding ocean and its islands, climate, animals and plants, human activity, politics, and Antarctica and the arts. Special activities to support the chapter on day and night in Antarctica are included.



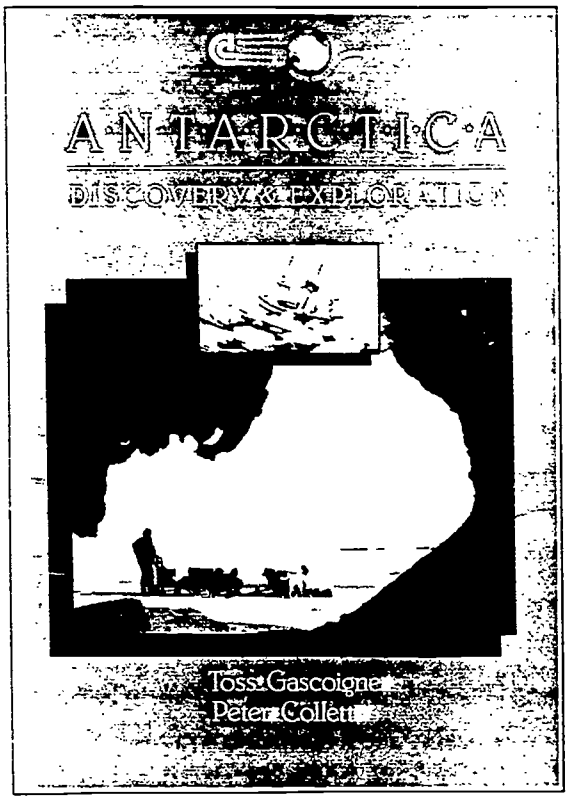
Antarctica: Discovery and Exploration

Antarctica was the last continent to be discovered. Humans saw it for the first time two hundred years ago, when they managed to fight their way through the stormy seas, thick fogs and swirling ice fields which surround the continent.

What did they find? A white desert, bitterly cold, windswept, and covered with ice a thousand metres thick. Despite the difficulties, the explorers pressed on. They had to cope with frostbite, snowblindness, sastrugi, crevasses, blizzards and scurvy. Exploration often turned into a desperate battle just to stay alive.

Since 1950 the nations of the world have cooperated to explore Antarctica in an organised way. They have approached the subject cautiously, because they are aware that this continent is one of the last great areas of wilderness in the world.

"Antarctica: Discovery and Exploration" can be used as either a teacher or a student resource. It describes the early exploration of Antarctica, looks in detail at four of the great explorers of the "heroic age" - Amundsen, Scott, Shackleton and Mawson - and tells of the work of the expeditioners and scientists of modern times. A chronology of exploration, a bibliography and a film list are included.



It Happened in Antarctica

This is a collection of observations which require scientific explanations. The weather and physical conditions of Antarctica are unique. It is a land of extremes and contrasts where observed events can be difficult to relate to the scientific principles we have formulated in more familiar environments.

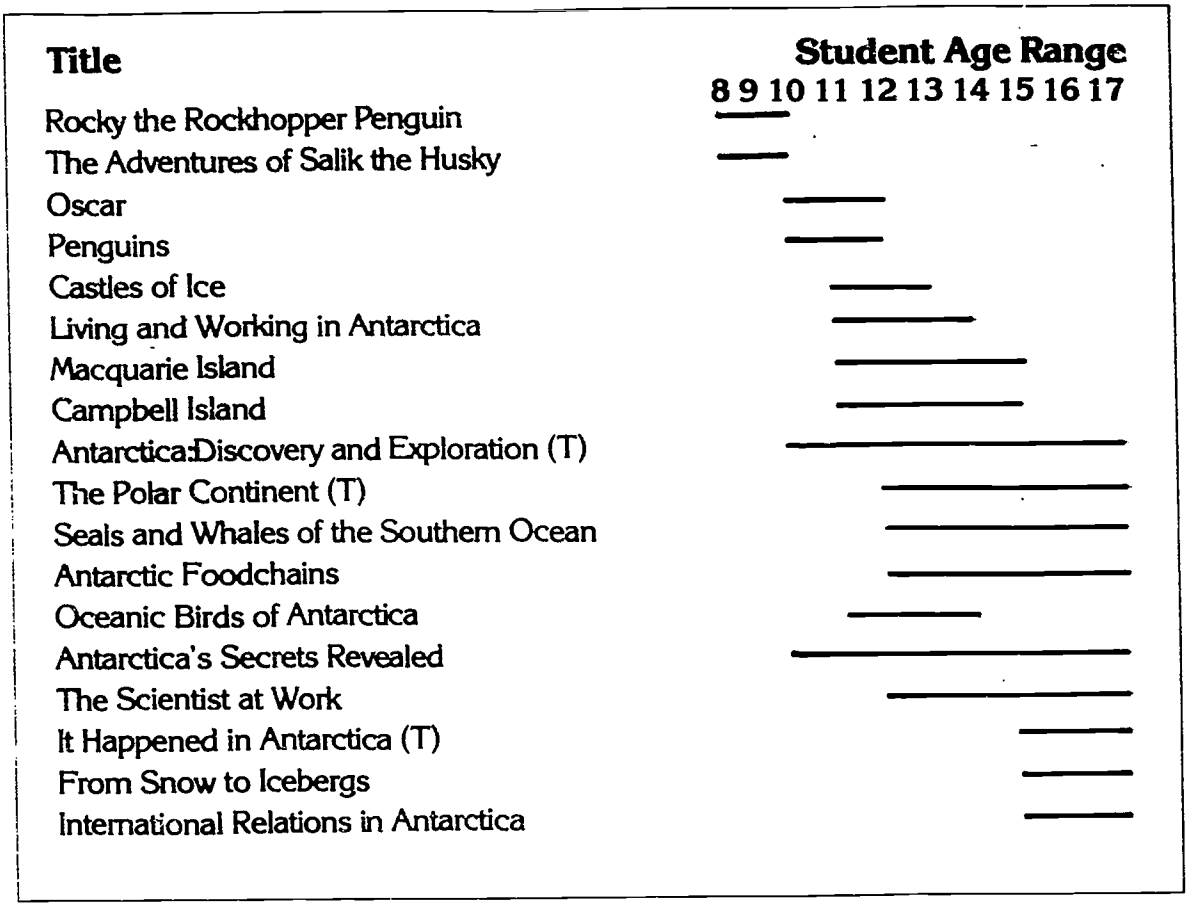
The examples of unusual and interesting phenomena provided in "It Happened in Antarctica" have been drawn from accounts of Antarctic expeditions, both published and unpublished. They are not merely a collection of facts, but offer an opportunity to test understanding of some of the basic principles of science. In some cases, answers to questions are provided; in others, it is up to you to work them out. Subjects covered include heat flow, optical phenomena, windchill, magnetism, ice movement and chemical reactions under the extreme conditions of the frozen continent.

"It Happened in Antarctica" includes suggested student activities, and can be used as both a teacher and a senior student resource.

2. Student materials

Student age ranges

This listing is a guide to intended student age ranges for each of the Antarctic Project titles. Individual students' and teachers' requirements will vary considerably, and the listing is not meant to be prescriptive. Titles for teachers (marked T) are also listed here.



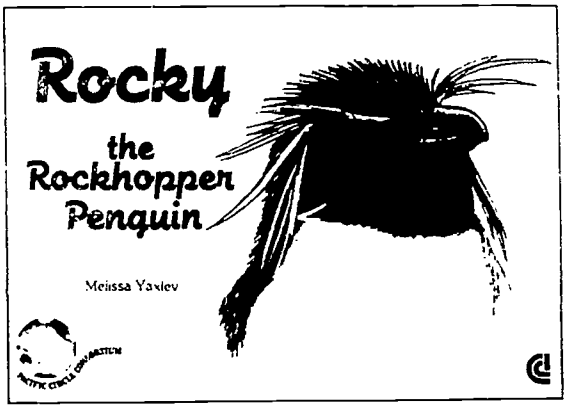
Two storybooks of Antarctic adventure for eight to ten-year-olds. Simple glossaries of unfamiliar terms are included.

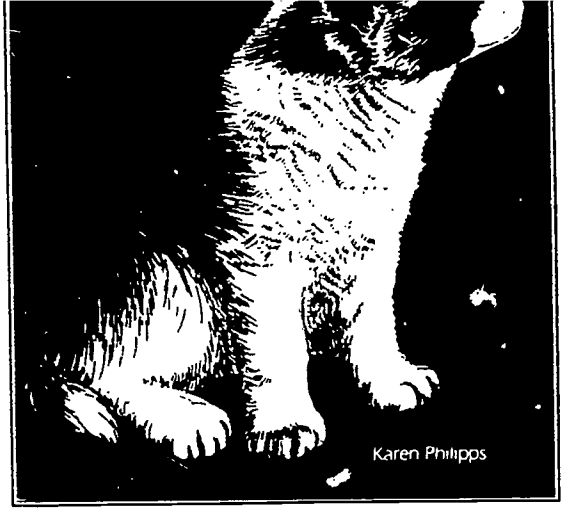
Rocky the Rockhopper Penguin

On Macquarie Island live thousands of rockhopper penguins. They make their nests in the grass and the chicks are guarded carefully by their parents until they have waterproof feathers and can learn to swim.

Rocky is one of these rockhoppers. But he is no ordinary penguin. Rocky decides to go exploring and he swims far away, just as soon as he can. Watching out for enemies like leopard seals, he makes his way to an island covered with Adelie penguins. When the Adelies tell Rocky about Antarctica, he decides to set off exploring once more.

The journey is long, but Rocky finds his way to the southern continent. There he meets up with old friends and makes some new ones among the emperor penguins.





We find out about the life of a dog team and the work dogs do.

When we leave Salik, he is among an emperor penguin colony, dreaming of the day when he will lead the dog team.

Project materials - middle grades

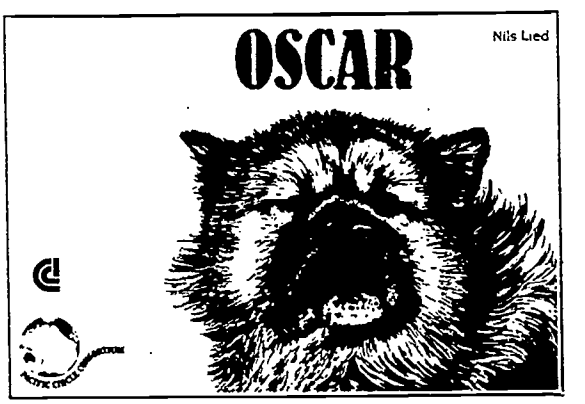
A storybook and a sourcebook for ten- to twelve-year-olds. They include simple glossaries of unfamiliar terms.

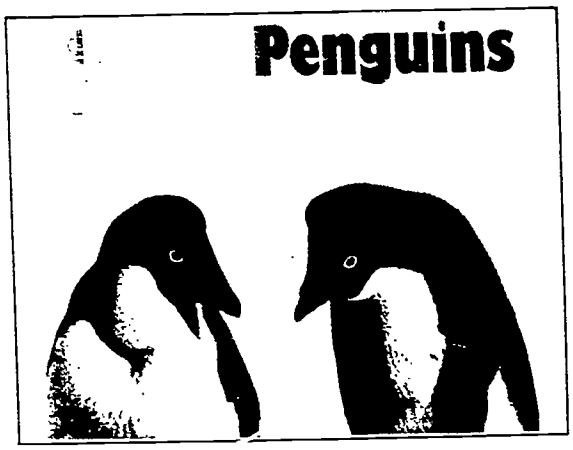
Oscar

Oscar was a real dog and the events that are described in this story, written by Antarctic expeditioner Nils Lied, all took place.

Dogs have played an important part in the exploration of Antarctica. Roald Amundsen reached the South Pole with the help of a dog team. Most of the early expeditions used dogs to sledge across the ice and some explorers owed their lives to the courage and skill of the huskies.

These days motor toboggans, tractors and aircraft have taken the place of the dog teams. At Mawson, Davis and Scott Base, however, there are still dog teams and dog handlers. People at these bases enjoy the company of the dogs and the occasional sledge trip serves as a reminder of the days when the huskies were the main form of transport in Antarctica.





Penguins

Many people love penguins and it is easy to see why. They look very appealing as they waddle about and seem to act a lot like people as they gather in large groups, and make elaborate gestures and noises. Penguins are devoted parents, with the mother and father sharing the job of hatching the eggs and feeding and caring for the chicks.

Penguins can live in very cold places because they have blubber and a layer of down underneath their feathers to keep them warm. They feed on the abundant supplies of fish, krill and shrimp found in the Southern Ocean.

Information on three kinds of penguins is to be found in this sourcebook. The rockhopper penguin lives on sub-Antarctic islands and makes its nest of a few blades of tussock grass, among the rocks of the foreshore. Adelies go to Antarctica in the spring to make their stony nests in colonies of hundreds of thousands. Emperors, the largest of the penguins, breed right on the Antarctic sea ice in the early winter.

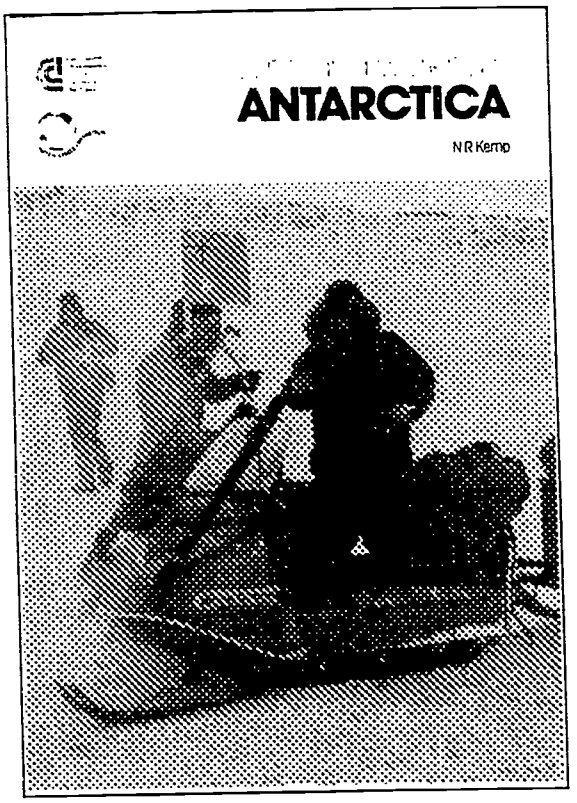
Project materials - middle grades/ secondary students

A storybook and a sourcebook for eleven- to fourteen-year-olds. Glossaries included.

Castles of Ice

"Castles of Ice" is a true story of Antarctic exploration. It is an account of a sledge trip undertaken by Antarctic expeditioner Nils Lied, with two companions, in the late nineteen-fifties. Starting from the Australian base at Mawson, they had to cross the sea ice to locate the Douglas Islands and fix them on the map.

The story tells us much about life in Antarctica. We learn of the love of a dog handler for his huskies, which are still used in Antarctica, even in these days of motor toboggans and helicopters. (You can learn more of one of the huskies in another story in this series, "Oscar"). We gain a glimpse of the difficulties the explorers encountered as they battled with the elements, from tide cracks to blinding blizzards. We learn of the hardships of travelling, cooking, sleeping and carrying out scientific work in the harsh Antarctic environment.



Living and Working in Antarctica

Have you ever given thought to what it is like in Antarctica? In winter the whole continent is under a thick layer of ice and snow. Even in summer there are only a few outcrops of rock on the coast. It is colder than the freezer in a refrigerator. Antarctica has the "worst" weather in the world. It is not only the coldest, but also the windiest continent.

Even though weather conditions are extreme, people go to Antarctica to work every summer. Some of them stay there during the winter as well.

How do people get to Antarctica? Why do they go there? What do they do in Antarctica? How do they dress to protect themselves against the severe cold? What do they do in their spare time? This sourcebook gives answers to these question, and many more.

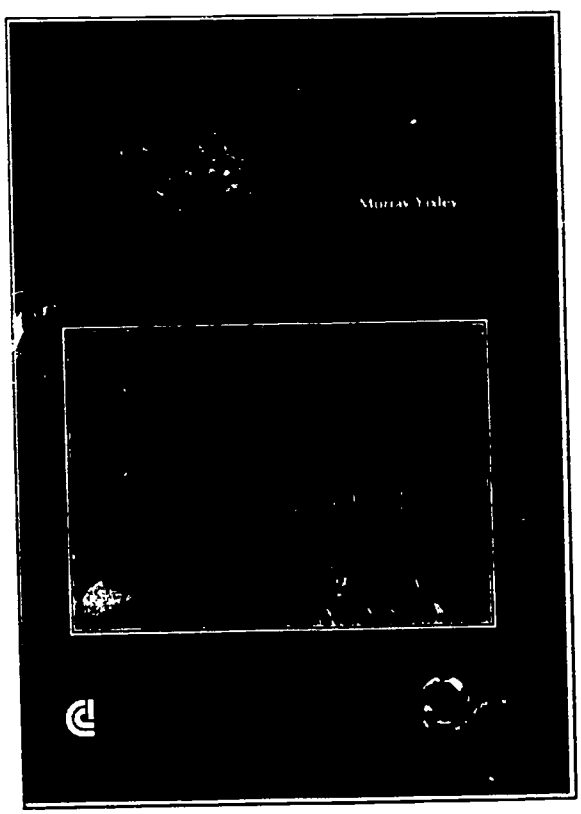
Project materials - middle grades/ secondary students

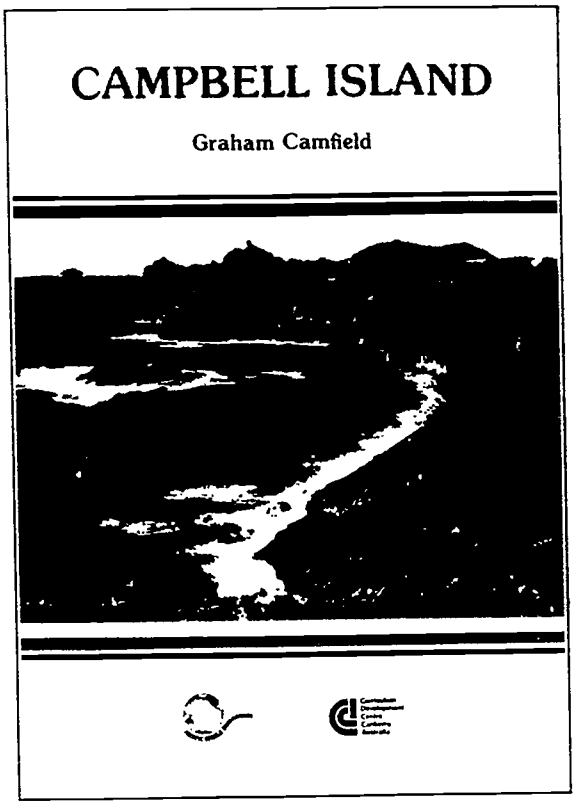
Two sourcebooks for eleven- to fifteen-year-olds dealing with two sub-Antarctic islands. Glossaries and resource lists are included.

Macquarie Island

"The island is dreadfully dreary to the ordinary observer ..." wrote one visitor to Macquarie island in 1900. Seventy years before another writer had called it "this dreary purgatory". Difficult to approach from the sea, lying exposed to the fierce westerlies of the Roaring Forties, its treeless slopes half hidden in cloud - what interest could there be in this forbidding place?

Yet Macquarie Island has attracted visitors ever since it was discovered in 1810. Sealers, explorers and scientists were all drawn to the island. This book explains why. It tells something of Macquarie Island's romantic history, its rich wildlife, and - despite what those early visitors wrote - the beauty of its wild and sometimes dangerous landscape.





Campbell Island

Far to the south of New Zealand, swept by the gales of the Southern Ocean, lies a tiny speck of land: Campbell Island. Discovered less than two hundred years ago, it has seen shipwreck, the mass slaughter of wildlife, and the doomed struggle of farmers to make a living from its soil.

It is a harsh place. Yet every year the government of New Zealand sends a small expedition across the wild seas to staff the weather station on Campbell Island. Why is the island so important?

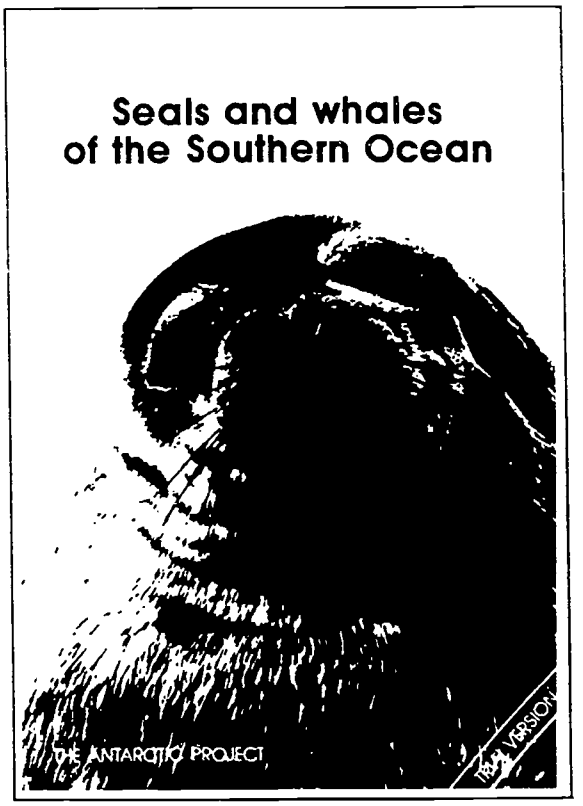
This book sketches the history of Campbell Island. It tells how the islands incredibly rich wildlife, the changes to its natural environment since discovery, and its good location for the study of the Earth's weather and atmosphere, make it one of the most fascinating spots in the Southern Ocean.

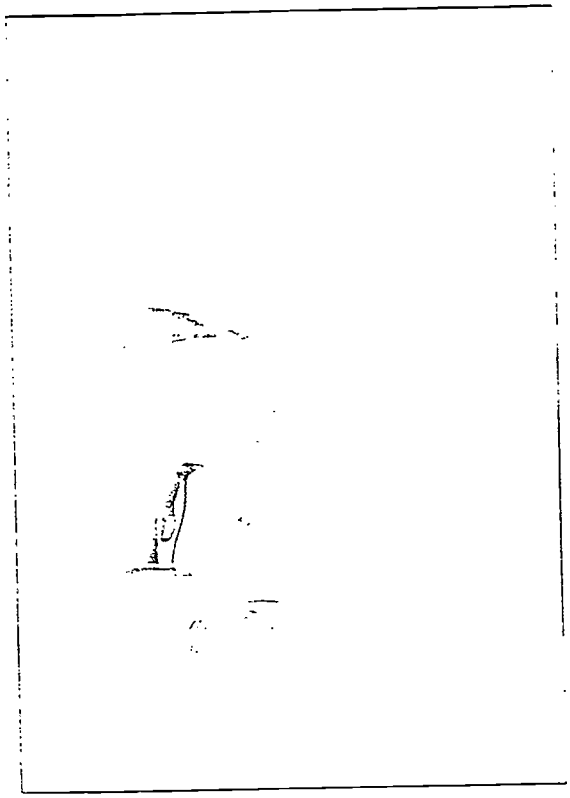
Three sourcebooks for eleven- to seventeen-year-olds dealing with the wildlife of the Southern Ocean and Antarctica.

Seals and Whales of the Southern Ocean

Whales and seals are marine mammals found in almost all the oceans of the world. This book introduces the species found in the Southern Ocean, and enables students to investigate their nature, behaviour and role in the ecosystem.

Special attention is given to the Weddell seal, the southern elephant seal and the humpback whale. The human impact on these animals over the past two hundred years is also covered.





Antarctic Foodchains

It is essential to the development of the important ideas of this module and others concerning the Antarctic ecosystem that students have a basic understanding of the foodchain concept.

The single most important creature in the Southern Ocean ecosystem is, without a doubt, the shrimp-like crustacean called "krill". As the principal herbivore at the base of the food web, it converts planktonic plant matter to animal matter, which is then available as food for creatures higher up in the food pyramid. The survival of groups such as whales, seals, birds, fish and squid depends, directly or indirectly, on this tiny creature. But, increasingly, krill have also been sought after by more recent visitors to the cold Antarctic oceans ... people!

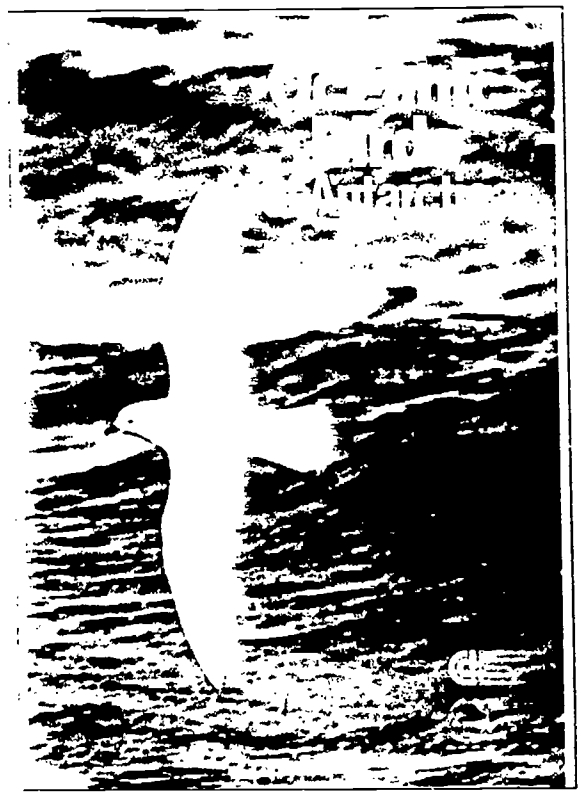
"Antarctic Foodchains" investigates the importance of krill to the Antarctic marine ecosystem and invites teachers and students to explore the problems - technological, ecological and social - associated with its commercial exploitation.

Oceanic Birds of Antarctica

Although thirty-seven species of bird breed on the sub-Antarctic islands, only ten nest on the Antarctic continent. Of these, two are penguins, seven are petrels and one is a skua (which is related to the gulls). All of them depend on the sea for food.

Penguins and petrels are among the most primitive birds alive today. Of the petrel family, the largest and smallest are found in the Antarctic region: the majestic wandering albatross and the tiny Wilson's storm petrel, which is the size of a sparrow.

In this book we take a close look at three of Antarctica's oceanic birds - the snow petrel, the skua and the Adelie penguin.



Two sourcebooks for ten- to seventeen-year-olds: questions most often asked about Antarctica and accounts by scientists who have worked in Antarctica.

Antarctica's Secrets Revealed

A collection of over a hundred of the typical questions that students ask about Antarctica and the answers and explanations to these questions. Students will dip into this booklet and their knowledge and understanding of the frozen continent will increase.

As with all books produced in the Antarctic Project, the contents have been discussed with people who have many years of first-hand experience in Antarctica.

The Scientist at Work

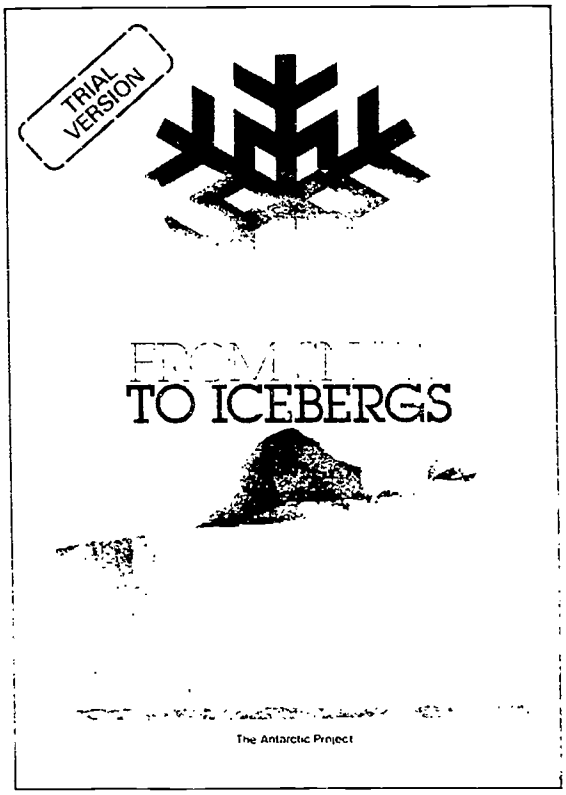
New techniques, new concepts and new technology have transformed scientific research in Antarctica. Yet the scientists who travel south are drawn by the same lure as the explorers of a century ago - the challenge of the unknown, the beauty of an unspoilt continent, and an interest in scientific research.

In this book you will find accounts by two scientists who have worked in Antarctica. A geographer with the NZARP tells of the excitement and challenges of his trips south, and a geologist who led an international expedition into the interior of Antarctica explains why planning, preparation and logistic support are so vital for scientific work on the frozen continent.

There is also an account of the difficulties faced by scientists doing fieldwork in Antarctica and an article which looks at the part women have played in scientific research there. Finally, two articles deal with the special stresses - physical, personal and social - which scientists must handle in the extreme conditions of the world's coldest continent. An extensive range of student activities is also included.

Materials for upper secondary students

Two sourcebooks for fifteen- to seventeen-year-olds.

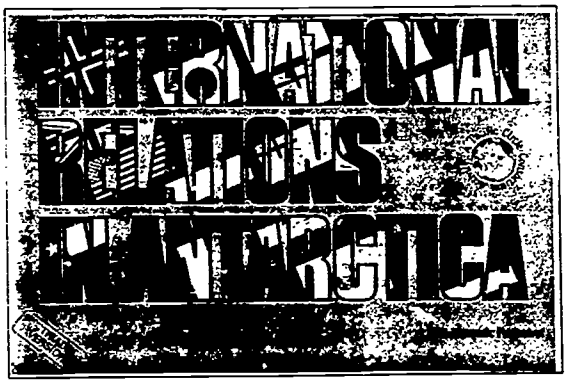


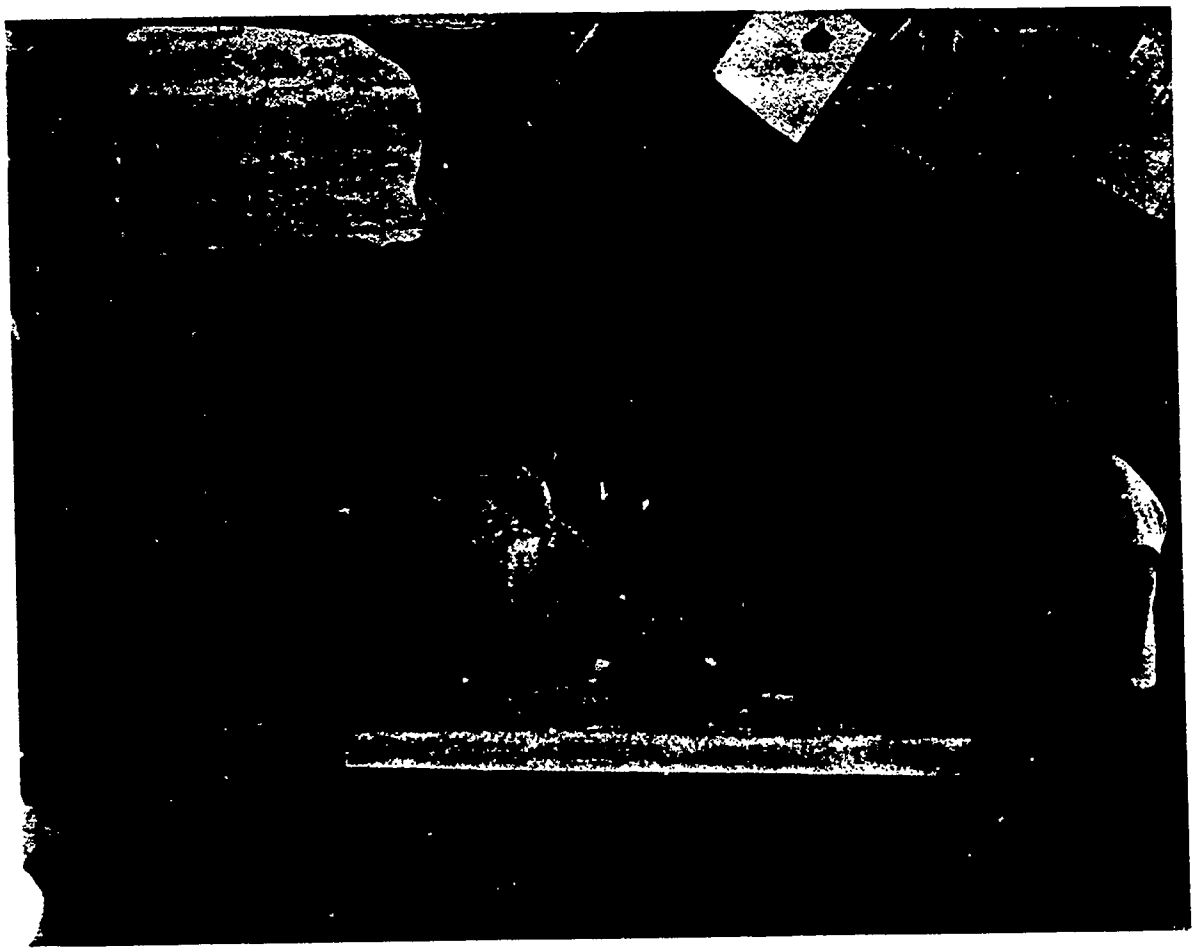
From Snow to Icebergs

The landscape of pack ice, icebergs and glaciers is an alien world for most of us. This introduction to glaciology takes students through this world, from snow to icebergs. A scientific approach to snow and ice, the polar ice sheets, glaciers, ice shelves, moving ice, sea ice and icebergs.

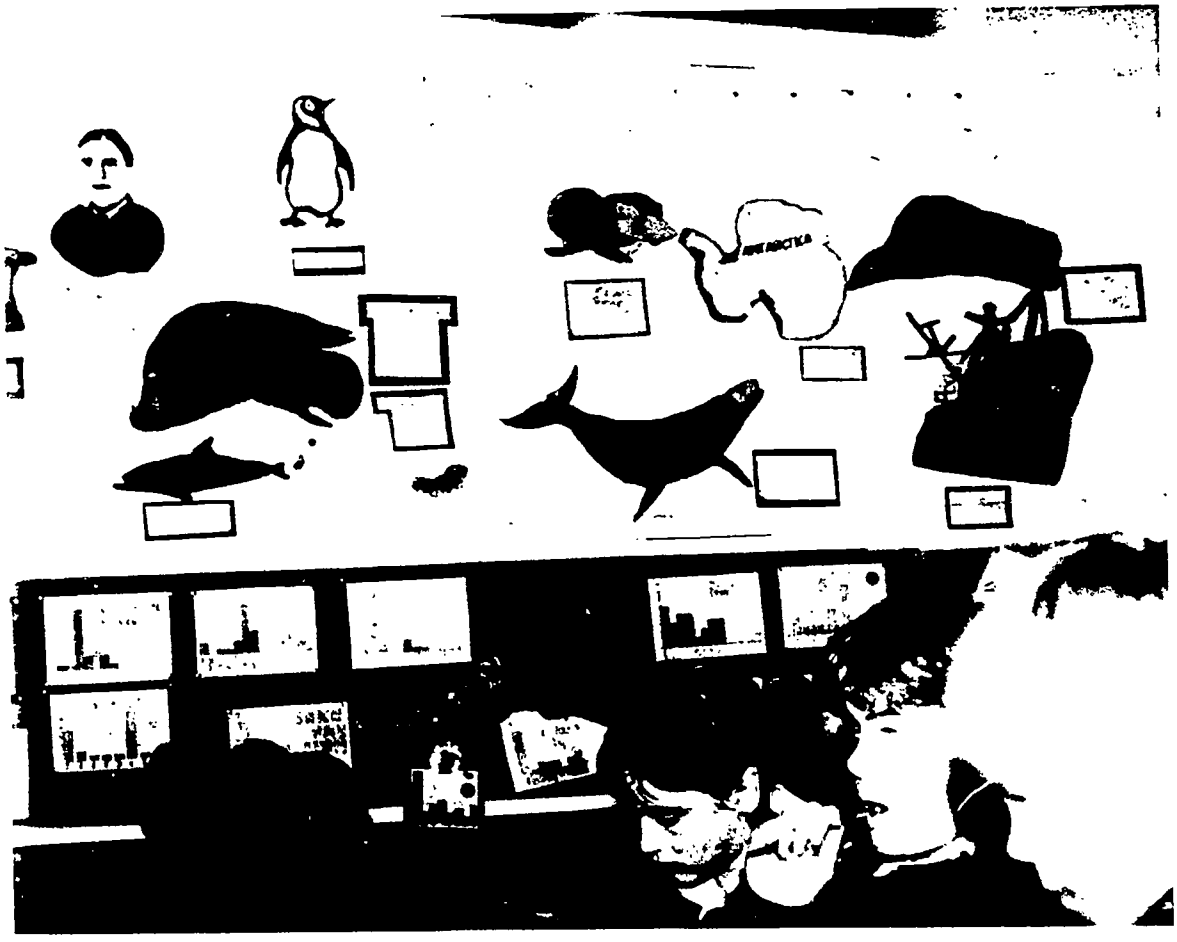
International Relations in Antarctica

Antarctica provides a unique working model of international co-operation. Issues such as sovereignty, scientific research, mineral exploration, environmental questions and the future of Antarctica are addressed in this module. It also looks in detail at the Antarctic Treaty.






LAND OF EXTREMES



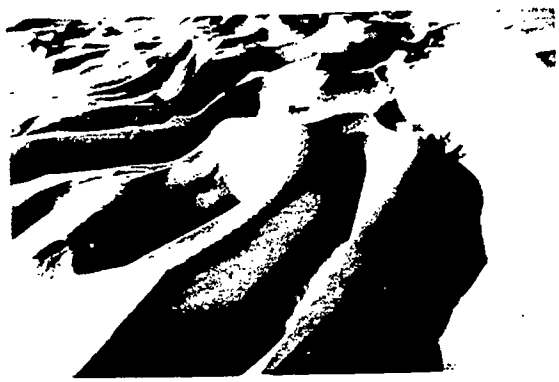
Using the Antarctic Project Materials:

Practical suggestions for classroom approaches

Introducing Antarctica

Geographers tend to show the Indian, Pacific and Atlantic Oceans extending south to the margins of the Antarctic continent. This may be geographically convenient, but it hides the special nature of the ring of water around the Antarctic continent which is more accurately termed the Southern Ocean. The Southern Ocean is unique in that it completely encircles the Earth, unbroken by a continental landmass. The narrowest constriction, the Drake Passage, is the 1112 kilometres between South America and the tip of the Antarctic Peninsula, while elsewhere the distance between Antarctica and the nearest continent is more than 2500 kilometres.

The Antarctic continent is similarly unique in its environment and its effect on the rest of the world. The ice cap is a major influence on world weather patterns. All of the weather systems over the southern hemisphere are generated in, or influenced by, the Antarctic. Sea waters which wash Antarctic shores are carried to all the corners of the world's oceans, taking with them vast quantities of nutrients.



Top: Sastrugi — wind-sculptured ice

The Earth's magnetic fields converge at the Poles giving rise to localised physical phenomena, the study of which has led to greater understanding of the basic characteristics of the planet.

The continent itself has a total area of almost fourteen million square kilometres. About ninety-eight percent is covered by an ice sheet with a mean thickness of 1800 metres containing about ninety percent of the world's fresh water.

Being largely isolated from the effects of civilisation in other parts of the world, the Antarctic continent provides a benchmark by which global pollution, climatic changes and the effects of human activity on Earth may be measured. Antarctica is scientifically important. It may also prove to be economically vital because of its resources.

A more important uniqueness derives from its tradition of co-operation among peoples of all ideologies and cultures. It seems that there the opportunity exists for people to avoid the conflict and confrontation that have usually accompanied the development of new frontiers.

Example classroom approaches

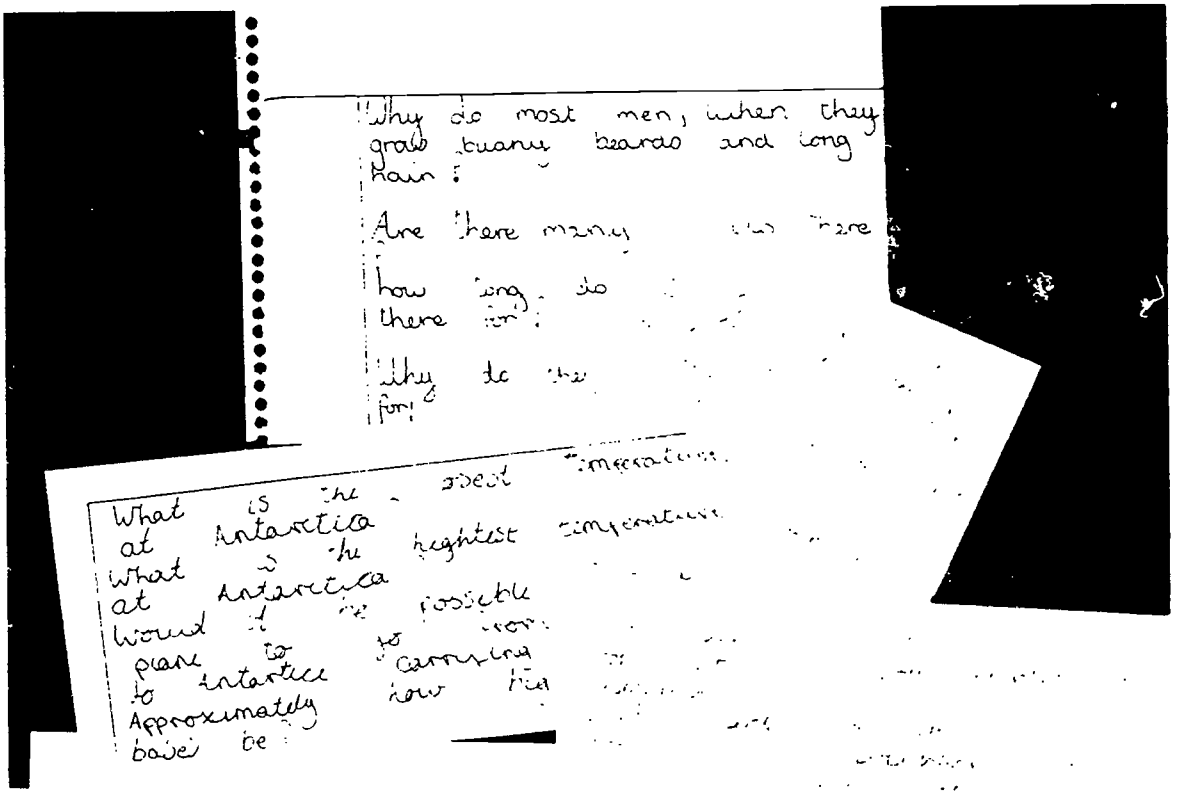
Multi-level materials such as the Antarctic Project series need multi-level approaches. Although students at different age levels will be concerned with different aspects of the study of Antarctica it can be seen as a continuum of learning. Boundaries of what may seem appropriate at different levels will be blurred and individual students and classes may move away from mainstream interests.

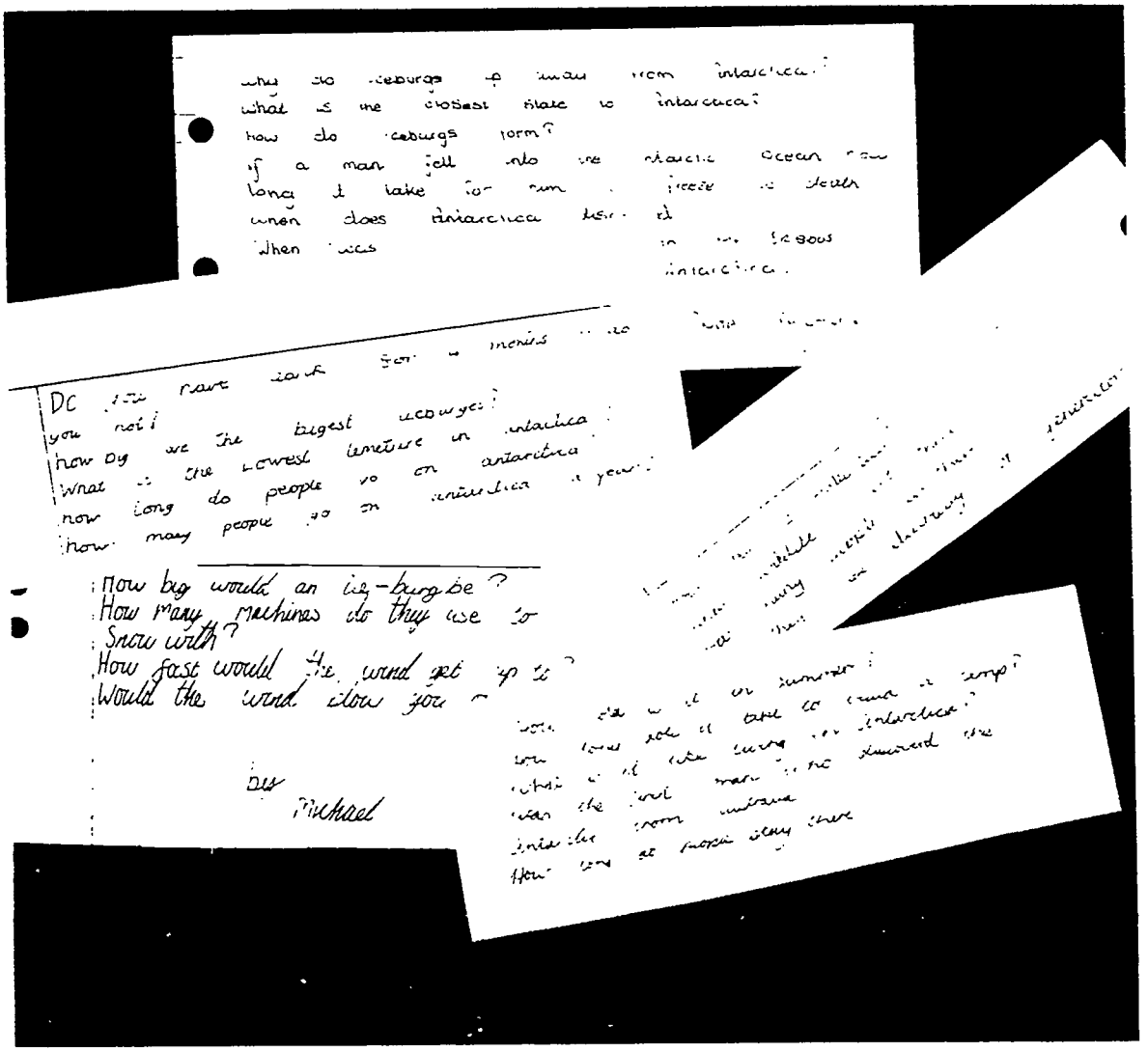
To cater for this broad range in age, ability and interest this section supplies notes on preparatory learning and three examples of teacher programming. The samples have been tailored to correspond to needs identified during trialling of the Project materials. They illustrate ways in which learning can be channelled in more intensive and specific directions.

Approach	Rationale
Preparatory learning	Highlights the need for a background of basic knowledge to be mastered before in-depth learning takes place.
EXAMPLE 1	
Cross-curriculum approach for younger learners	This sample program shows how maths, science, social studies, language and art and craft activities can be developed around the theme "Antarctica".
EXAMPLE 2	
A modular approach for middle grades	This example seeks to identify the aspects of study most commonly targetted by students. It then goes on to draw out the concepts involved, to pose a series of focussing questions and to provide a sample of the learning experiences that could be undertaken to develop knowledge and competency objectives.
EXAMPLE 3	
Rationale for a unitised short course for secondary students	This approach is developed for students within a social sciences curriculum or as an independent short course of approximately twenty-five hours duration.

All example approaches include lists of Antarctic Project materials which are particularly relevant to different aspects of study.

During trialling, ten- and eleven-year-old students in a Tasmanian school identified these questions when asked what they would like to know about Antarctica:





Preparatory learning

As indicated by the questions identified during trialling of the Antarctic Project materials, students are vitally interested in Antarctica but lack knowledge of its environment and people's experiences on and around this vast frontier.

In order to understand Antarctica and make the best use of the learning materials, students will require some basic spatial knowledge about the continent. This may be introduced either before the main learning program or used incidentally to gradually build up contextual understanding.

This essential phase of enquiry requires a substantial degree of mastery, in the sense that if concepts are not understood later learning may be impaired.

After conducting an initial brainstorming session with students, experience has shown that teachers are likely to find students' questions falling into these five areas of interest:

- Where is Antarctica and the South Pole?
- How is the Antarctic different from the Arctic?
- What is the weather like?
- Who goes there and what is it like to work there?
- What creatures and plants are found there?

On the following pages a possible approach to this preparatory stage of learning is outlined. Although designed for middle grades it is multi-level in its approach. Trialling experience has shown that students at secondary level often know little more about Antarctica than younger children. Teachers at either primary or secondary level need only adapt the complexity and length of lesson time to their own requirements.

Where appropriate to the class learning program, this preparatory or overview stage can be extended. It is also a good stage at which to negotiate the learning program to be followed with students who wish to give priority to aspects of particular interest.

Organising questions	Suggested activities
• Where is Antarctica and the South Pole?	• Using globes and maps identify the Antarctic continent and locate the South Pole. • Discuss latitudinal measurement. • Define Antarctica in simple terms.
• How is the Antarctic different from the Arctic?	Establish ideas that: • Antarctica is a continental area, not sea.
• What is the weather like?	• Build on student's knowledge of the Earth to describe "gross environmental" conditions in Antarctica. • Correct misconceptions. • Reinforce basic vocabulary and prepare a display area for Antarctic words. • Discuss the nature of ice and snow. What is it? How does it form? How does snow turn to ice? How do
• Who goes there and what is it like to work there?	• List the categories of people who have been or do go to the Antarctic, eg sealers, whalers, explorers, scientists . . . • Brainstorm with the class
• What creatures and plants are found there?	• List the creatures and the plants the students know inhabit the Antarctic region. • Display pictures of creatures with questions relating to possible areas of research and

• Using dividers measure the relative distances between Antarctica and other parts of the world. • Trace around Antarctica and the other continents on a globe and compare their relative sizes.	
• The Antarctic is colder than the Arctic. • Antarctica is separated from other lands by the Southern Ocean.	
icebergs form'? • Display posters and photos of large ice masses. • Enjoy creative artistic pursuits. • Prepare an ice map of Antarctica. • Discuss the idea that Antarctica is a white desert • Consider the high winds of Antarctica and the problem of windchill.	
to determine likely problems in travelling to and working in Antarctica. These aspects could then form the basis for a thorough investigation.	
references to appropriate project materials. This could well include "mystery creatures" that students may not be aware of, eg krill, the wingless fly . . .	

Project resources

Blank map for photocopying (see the back page of this guide.)
*** Antarctica's Secrets Revealed**
*** The Polar Continent**

*** Antarctica's Secrets Revealed**
*** The Polar Continent**

*** The Polar Continent**

*** The Polar Continent**
*** Antarctica's Secrets Revealed**
*** Living and Working in Antarctica**
*** Castles of Ice**
*** The Scientist at Work**
*** Antarctica: Discovery and Exploration (includes an excellent chronological list of explorers)**

*** The Polar Continent**
*** Antarctica's Secrets Revealed**
*** Campbell Island**
*** Macquarie Island**
*** Seals and Whales of the Southern Ocean**
*** Penguins**
*** Rocky the Rockhopper Penguin**
*** Antarctic Foodchains**
*** Oceanic Birds of Antarctica**

A cross-curriculum approach for younger learners

Science
- Freezing and thawing experiments.
- Grouping into classes according to different criteria, eg birds, mammals.
- Individual or group research on creatures of the Antarctic.

Social studies
- Location on globe and map.
- Living, working in Antarctica:
  - clothing
  - shelter
  - food
  - transport
- Visit by an Antarctic expeditioner.
- The Australian $100 note.
- Antarctic stamps.

Art and craft
- Large mural of seals, whales and penguins.
- Mobiles of origami whales.
- Individual paintings, prints, models, drawings of animals of the Antarctic.
- Group collage of a husky team.
- Modelling an Antarctic community - real or imaginery.

Maths
- Measuring temperature.
- Geodesic dome construction.
- Relative distance measurement with string.
- Measure out the length of creatures such as a blue whale, emperor penguin and elephant seal, in playground

Antarctica

Language
- What do you want to know about Antarctica?
- Reading, writing and sharing of stories and poems
- Communicating research
- Role play on Antarctic themes
- Vocabulary building - Antarctic words
- Develop class Antarctic scrap book.
- Write letters home as an Antarctic resident.

Project materials

Teachers: Living and Working in Antarctica
Antarctica's Secrets Revealed
Castles of Ice
Antarctica: Discovery and Exploration
The Polar Continent

Students: Rocky the Rockhopper Penguin
Penguins
Oscar
Salik the Husky

Content Trialling has suggested that these are the aspects students wish to pursue:	Focus questions Focus questions emanating from these content areas are likely to include:
History - exploration and heroes	Who were the first Antarctic explorers? What was it like to be an early Antarctic explorer? What were some of their successes and failures?
Humans and the harsh environment	Why do people go to Antarctica nowadays? What is their lifestyle and and work like? How has technology changed life in Antarctica?
Flora and fauna of Antarctica and the Southern Ocean	What plants and animals are found in Antarctica and the Southern Ocean? How do they adapt to the harsh environment? Are they protected in any way?
The future of Antarctica	In what ways may Antarctica be used in the future? Who lays claim to parts of Antarctica? What is the Antarctic Treaty? In what ways do countries co-operate in Antarctica?

Sample learning experiences

Project resources

- Prepare time lines and maps of of early explorations.
- Find out about the importance of sealers and whalers in Antarctic history.
- Research the exploits of individual explorers in detail.
- Compare Antarctic exploration with Arctic exploration.

→ Antarctica: Discovery and Exploration
Antarctica's Secrets Revealed

- Research what living and working in Antarctica is like nowadays.
- Compare life and work now with that of earlier Antarctic expeditioners.
- Prepare climate graphs.
- Discuss and list the human qualities that appear important for those who wish to work in Antarctica.
- Study similarities and differences between the environment of Antarctica and other harsh environments.

→ Living and Working in Antarctica
Castles of Ice
The Polar Continent
Antarctica's Secrets Revealed
The Scientist at Work
Oscar

- Use books in the project series to find out more about the creatures and plants of this region.
- Prepare charts, maps, collages, murals, case studies and diagrams of lifecycles of the wildlife in the area.
- Draw diagrams showing the foodchains of Antarctic creatures.
- Discuss the impact of people and introduced species on the native flora and fauna.
- Compare the flora and fauna of Antarctica with that of other cold places on Earth.

→ The Polar Continent
Rocky the Rockhopper Penguin
Penguins
Antarctica's Secrets Revealed
Antarctic Foodchains
Macquarie Island
Campbell Island
Oceanic Birds of Antarctica
Seals and Whales of the Southern Ocean

- Find out about the Antarctic Treaty and list and map the countries that are claimants, consultative parties and non-consultative parties
- Write the names of well-known Antarctic explorers and scientists on the map near their country of origin.
- Roleplay a situation of controversy about the use of Antarctic resources.
- Discuss how nations co-operate in Antarctica.
- Compare the attitude of co-operation with other instances in other places.

→ Antarctica: Discovery and Exploration
The Polar Continent
Antarctica's Secrets Revealed

Rationale for a unitised short course for secondary students

This approach is tailored to secondary students within a social sciences curriculum or can be used to develop a unitised short course.

This approach will provide students with knowledge and experiences which will give them a fuller understanding of the inter-relationship and interdependence between the physical environment of Antarctica and the Southern Ocean and human activity and lifestyles.

During their studies students will develop understandings about the nature of the Antarctic environment and the factors that influence environmental change. Students will also gain a greater understanding of the need for care and attention to detail when dealing with environmental change.

This approach will aid in the development of competencies in

- acquiring and conveying information,
- applying logical processes,
- working as an individual and as a group member,
- making judgements and decisions,
- working creatively,
- showing care and concern, and
- considering questions of beliefs and values.

This approach consists of a core or overview plus a cluster of related topics linked to different aspects of the study of the Antarctic and to the project materials.

Overview

The core section concentrates on the acquisition of knowledge about the nature of the Antarctic environment and the people who have faced its challenges.

The overview section is based on studies of

- the location and physical features of Antarctica,
- the factors that influence the climate of the Antarctic,
- the animal and plant life of the region, and
- humans and Antarctica.

In an enquiry-based program of learning this section could be structured around the key questions listed below.

- What are the main physical features of Antarctica?
- What factors influence Antarctica's climate?
- Who were the first people to venture into Antarctic waters?
- Why were they there?
- What difficulties did they face?
- What were some of the highlights of Antarctic exploration?
- What flora and fauna are to be found in Antarctica and the Southern Ocean?
- What other natural resources are to be found in the Antarctic and should they be tapped?
- What human activities take place in Antarctica today?
- What is it like to live and work in Antarctica?
- What does the future hold for Antarctica?

Overview expansion

Individuals, students or groups may then like to move to a more detailed study of topics such as

- The discovery and exploration of Antarctica
- Creatures of Antarctica and the Southern Ocean
- Living and working in Antarctica
- Macquarie or Campbell Island
- Antarctic foodchains
- Seals and whales in the Southern Ocean
- Penguins
- Science and Antarctica.

Project materials to support these studies

The Polar Continent
Antarctica: Discovery and Exploration
Antarctica's Secrets Revealed
The Scientist at Work
Antarctic Foodchains
Oceanic Birds of Antarctica
Macquarie Island
Campbell Island
It Happened in Antarctica
Living and Working in Antarctica
Seals and Whales of the Southern Ocean.

The Antarctic Treaty

The Governments* of Argentina, Australia, Belgium, Chile, the French Republic, Japan, New Zealand, Norway, the Union of South Africa, the Union of Soviet Socialist Republics, the United Kingdom of Great Britain and Northern Ireland, and the United States of America;

Recognizing that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord;

Acknowledging the substantial contributions to scientific knowledge resulting from international co-operation in scientific investigation in Antarctica;

Convinced that the establishment of a firm foundation for the continuation and development of such co-operation on the basis of freedom of scientific investigation in Antarctica as applied during the International Geophysical Year accords with the interests of science and the progress of all mankind;

Convinced also that a treaty ensuring the use of Antarctica for peaceful purposes only and the continuance of international harmony in Antarctica will further purposes and principles embodied in the Charter of the United Nations;

Have agreed as follows:

Article I

1. Antarctica shall be used for peaceful purposes only. There shall be prohibited, *inter alia*, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvers, as well as the testing of any type of weapons.
2. The present Treaty shall not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose.

Article II

Freedom of scientific investigation in Antarctica and co-operation toward that end, as applied during the International Geophysical Year, shall continue, subject to the provisions of the Treaty.

Article III

1. In order to promote international co-operation in scientific investigation in Antarctica, as provided for in Article II of the present Treaty, the Contracting Parties agree that, to the greatest extent feasible and practicable:
   a. information regarding plans for specific programs in Antarctica shall be exchanged to permit maximum economy and efficiency of operations;
   b. scientific personnel shall be exchanged in Antarctica between expeditions and stations;
   c. scientific observations and results from Antarctica shall be exchanged and made freely available.
2. In implementing this Article, every encouragement shall be given to the establishment of cooperative working relations with those Specialized Agencies of the United Nations and other international organizations having a scientific or technical interest in Antarctica.

Article IV

1. Nothing contained in the present Treaty shall be interpreted as:
   a. a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctica;
   b. a renunciation or diminution by any Contracting Party of any basis of claim to territorial sovereignty in Antarctica which it may have whether as a result of its activities or those of its nationals in Antarctica, or otherwise;
   c. prejudicing the position of any Contracting Party as regards its recognition or non-recognition of any other State's right of or claim or basis of claim to territorial sovereignty in Antarctica.
2. No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force.

Article V

1. Any nuclear explosions in Antarctica and the disposal there of radioactive waste material shall be prohibited.
2. In the event of the conclusion of international agreements concerning the use of nuclear energy, including nuclear explosions and the disposal of radioactive waste material, to which all of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX are parties, the rules established under such agreements shall apply in Antarctica.

Article VI

The provisions of the present Treaty shall apply to the area south of 60° South Latitude, including all ice shelves, but nothing in the present Treaty shall prejudice or in any way affect the rights, or the exercise of the rights, of any State under international law with regard to the high seas within that area.

Article VII

1. In order to promote the objectives and ensure the observance of the provisions of the present Treaty, each Contracting Party whose representatives are entitled to participate in the meetings referred to in Article IX of the Treaty shall have the right to designate observers to carry out any inspection provided for by the present Article. Observers shall be nationals of the Contracting parties which designate them. The names of observers shall be communicated to every other Contracting Party having the right to designate observers, and like notice shall be given of the termination of their appointment.
2. Each observer designated in accordance with the provisions of paragraph 1 of this Article shall have complete freedom of access at any time to any or all areas of Antarctica.
3. All areas of Antarctica, including all stations, installations and equipment within those areas, and all ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica, shall be open at all time to inspection by any observers designated in accordance with paragraph 1 of this Article.
4. Aerial observation may be carried out at any time over any or all areas of Antarctica by any of the Contracting Parties having the right to designate observers.
5. Each Contracting Party shall, at the time when the present Treaty enters into force for it, inform the other Contracting Parties, and thereafter shall give them notice in advance, of
   a. all expeditions to and within Antarctica, on the part of its ships or nationals, and all expeditions to Antarctica organized in or proceeding from its territory;
   b. all stations in Antarctica occupied by its nationals; and
   c. any military personnel or equipment intended to be introduced by it into Antarctica subject to the conditions prescribed in paragraph 2 of Article I of the present Treaty.

Article VIII

1. In order to facilitate the exercise of their functions under the present Treaty, and without prejudice to the respective positions of the Contracting Parties relating to jurisdiction over all other persons in Antarctica, observers designated under paragraph 1 of Article VII and scientific personnel exchanged under subparagraph 1(b) of Article III of the Treaty, and members of the staffs accompanying any such persons, shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctica for the purpose of exercising their functions.
2. Without prejudice to the provisions of paragraph 1 of this Article, and pending the adoption of measures in pursuance of subparagraph 1(e) of Article IX, the Contracting Parties concerned in any case of dispute with regard to the exercise of jurisdiction in Antarctica shall immediately consult together with a view to reaching a mutually acceptable solution.

*Original signatories

Article IX

1. Representatives of the Contracting Parties named in the preamble to the present Treaty shall meet at the City of Canberra within two months after the date of entry into force of the Treaty, and thereafter at suitable intervals and places, for the purpose of exchanging information, consulting together on matters of common interest pertaining to Antarctica, and formulating and considering, and recommending to their Governments, measures in furtherance of the principles and objectives of the Treaty, including measures regarding:

a. use of Antarctica for peaceful purposes only;

b. facilitation of scientific research in Antarctica;

c. facilitation of international scientific cooperation in Antarctica;

d. facilitation of the exercise of the rights of inspection provided for in Article VII of the Treaty;

e. questions relating to the exercise of jurisdiction in Antarctica;

f. preservation and conservation of living resources in Antarctica.

2. Each Contracting Party which has become a party to the present Treaty by accession under Article XIII shall be entitled to appoint representatives to participate in the meetings referred to in paragraph 1 of the present Article, during such time as that Contracting Party demonstrates its interest in Antarctica by conducting substantial scientific research activity there, such as the establishment of a scientific station or the despatch of a scientific expedition.

3. Reports from the observers referred to in Article VII of the present Treaty shall be transmitted to the representatives of the Contracting Parties participating in the meetings referred to in paragraph 1 of the present Article.

4. The measures referred to in paragraph 1 of this Article shall become effective when approved by all the Contracting Parties whose representatives were entitled to participate in the meetings held to consider those measures.

5. Any or all of the rights established in the present Treaty may be exercised as from the date of entry into force of the Treaty whether or not any measures facilitating the exercise of such rights have been proposed, considered or approved as provided in this Article.

Article X

Each of the Contracting Parties undertakes to exert appropriate efforts, consistent with the Charter of the United Nations, to the end that no one engages in any activity in Antarctica contrary to the principles or purposes of the present Treaty.

Article XI

1. If any dispute arises between two or more of the Contracting Parties concerning the interpretation or application of the present Treaty, those Contracting Parties shall consult among themselves with a view to having the dispute resolved by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement or other peaceful means of their own choice.

2. Any dispute of this character not so resolved shall, with the consent, in each case, of all parties to the dispute, be referred to the International Court of Justice for settlement; but failure to reach agreement on reference to the International Court shall not absolve parties to the dispute from the responsibility of continuing to seek to resolve it by any of the various peaceful means referred to in paragraph 1 of this Article.

Article XII

1a. The present Treaty may be modified or amended at any time by unanimous agreement of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX. Any such modification or amendment shall enter into force when the depositary Government has received notice from all such Contracting Parties that they have ratified it.

b. Such modification or amendment shall thereafter enter into force as to any other Contracting Party when notice of ratification by it has been received by the depositary Government. Any such Contracting Party from which no notice of ratification is received within a period of two years from the date of entry into force of the modification or amendment in accordance with the provisions of subparagaph 1(a) of this Article shall be deemed to have withdrawn from the present Treaty on the date of the expiration of such period.

2(a) If after the expiration of thirty years from the date of entry into force of the present Treaty, any of the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX so requests by a communication addressed to the depositary Government, a Conference of all the Contracting Parties shall be held as soon as practicable to review the operation of the Treaty.

(b) Any modification or amendment to the present Treaty which is approved at such a Conference by a majority of the Contracting Parties there represented, including a majority of those whose representatives are entitled to participate in the meetings provided for under Article IX, shall be communicated by the depositary Government to all the Contracting Parties immediately after the termination of the Conference and shall enter into force in accordance with the provisions of paragraph 1 of the present Article.

c. If any such modification or amendment has not entered into force in accordance with the provisions of subparagraph 1(a) of this Article within a period of two years after the date of its communication to all the Contracting Parties, any Contracting Party may at any time after the expiration of that period give notice to the depositary Government of its withdrawal from the present Treaty; and such withdrawal shall take effect two years after the receipt of the notice by the depositary Government.

Article XIII

1. The present Treaty shall be subject to ratification by the signatory States. It shall be open for accession by any State which is a Member of the United Nations, or by any other State which may be invited to accede to the Treaty with the consent of all the Contracting Parties whose representatives are entitled to participate in the meetings provided for under Article IX of the Treaty.

2. Ratification of or accession to the present Treaty shall be effected by each State in accordance with its constitutional processes.

3. Instruments of ratification and instruments of accession shall be deposited with the Government of the United States of America, hereby designated as the depositary Government.

4. The depositary Government shall inform all signatory and acceding States of the date of each deposit of an instrument of ratification or accession, and the date of entry into force of the Treaty and of any modification or amendment thereto.

5. Upon the deposit of instruments of ratification by all the signatory States, the present Treaty shall enter into force for those States and for States which have deposited instruments of accession. Thereafter the treaty shall enter into force for any acceding State upon the deposit of its instrument of accession.

6. The present Treaty shall be registered by the depositary Government pursuant to Article 102 of the Charter of the United Nations.

Article XIV

The present Treaty, done in the English, French, Russian, and Spanish languages, each version being equally authentic, shall be deposited in the archives of the Government of the United States of America, which shall transmit duly certified copies thereof to the Governments of the signatory and acceding States.

IN WITNESS WHEREOF, the undersigned Plenipotentiaries duly authorized, have signed the present Treaty.

DONE at Washington this first day of December one thousand nine hundred and fifty-nine.

Source: THE ANTARCTIC TREATY SYSTEM, published for the Department of Foreign Affairs by AGPS.

Bibliography and film list

A massive amount has been written about Antarctica. State and National Libraries have extensive catalogue listings. The **Antarctic Bibliography,** published in the United States by the Library of Congress since 1965 lists current material. Many major libraries and state education departments also have film and video collections of Antarctic material.

Most of the books in this Antarctic Project series have detailed bibliographies pertinent to their particular interests. This listing is of a more general nature.

Antarctica - General

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Dufek, G — **Through the Frozen Frontier.** Brockhampton, Leicester (UK), 1960.

Dukert, J M — **This is Antarctica.** Angus and Robertson, Sydney, 1968.

Hargreaves, P (ed) — **The Antarctic.** Wayland, Hove (UK), 1980.

Icenhower, J — **The First Book of the Antarctic.** Watts, New York, 1971.

Land, Barbara — **The New Explorers: Women in Antarctica.** Dodd Mead, New York, 1981.

Mason, T K — **On the Ice in Antarctica.** Dodd Mead, New York, 1978.

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Smith, Craig — "My Impressions of Antarctica" in **The Australian Science Teachers Journal,** May 1987, Vol.33, No.1.

Toohill, I — **Mawson Base: Face to Face.** Education Department of Victoria, 1985.

Films

Antarctic (colour video, 1976). Film from the US National Science Foundation, covering international scientific research in Antarctica.

Australian Research in Antarctica (colour, 1975). Aspects of Antarctic research by the Australian Antarctic Division - medicine, glaciology, biology, cosmic rays.

Beyond the Pack Ice (colour, 1968). Aspects of work at Mawson. Film examines the mental and physical conditions under which research teams work.

Blowing Hot and Cold (colour, 1982). This NZ film gives an overview of the continent - its vast size, weather, the effect of the Antarctic ice-mass on world climate (from the series **Big Ice**).

140 Days Under the World (colour, 1964). One summer's work by NZ scientists, including exploration of some of the last unmapped areas.

Mawson Base: Face to Face (colour, 1984). Antarctica through the eyes of two expeditioners, a cook and a doctor. Raises issues on the future of Antarctica, gives insight into the daily pressures of life in isolation. Narration by Phillip Law. (Teacher's booklet also available - see above).

The Most Beautiful Place on Earth (colour, 1974). US film showing activities of geologists and scientists who live and work in Antarctica.

Out of Sight, Out of Mind (colour, 1983). Antarctica's history is full of noble failures of adventurers who did not appreciate the immense forces nature can show there. This NZ film shows that success in Antarctica is achieved through careful planning and methodical approach to exploration and scientific discovery.

Vostok 900 (colour, 1970). ABC record of a 1962 seismological traverse from Wilkes to the Russian base Vostok, 900 miles inland near the South Magnetic Pole. Difficulties of living, travelling and working in Antarctica.

Birds and other animals

Barnes, J N — **Let's Save Antarctica!** Greenhouse Publications, Melbourne, 1982.

Berrill, J — **Wonders of the Antarctic.** World's Work, Tadworth (UK), 1968.

Brown, D A — **Breeding Biology of the Snow Petrel.** ANARE Scientific Reports, publication No.89, 1965.

Burton, R — **Animals of the Antarctic.** Abelard-Schumann, London, 1970.

Deguine, J C — **Emperor Penguin - Bird of the Antarctic.** Angus and Robertson, Sydney, 1974.

Haper, P C and Kinsky, F.C — **Southern Albatrosses and Petrels.** Price Milburn, Wellington, 1978.

Harrison, P — **Seabirds - an Identification Guide.** Reed, Wellington, 1983.

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Mizumura, K — **The Emperor Penguins.** Black, London, 1970.

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Toohill, I — **Antarctica: the most incredible true story ever told** (film study guide). Peter Collins, Melbourne, 1985.

Software

Birds of Antarctica

Part of the Antarctic Science Data Base. A software package, written for BBC, Apple, IBM Personal, Tandy and MicroBee computers, by Elizabeth Computer Centre, Tasmanian Education Department, Hobart.

Films

Adelie Penguins of the Antarctic (colour, 1965). Records life cycle of the Adelie penguin, including courtship, nesting, rearing of chicks.

Antarctic Summer (colour, 1970). Describes animal life around Mawson and examines the work of biologists based there.

Antarctic Winter (colour, 1970). Winter at Mawson and its effect on an emperor penguin rookery.

Antarctica: the most incredible true story ever told (colour, 1984). In the winter of 1957 fifteen dogs were left behind at Japan's Syowa Base. When the expeditioners returned the next year they were astonished to find that two dogs had survived. This film reconstructs how this might have happened.

Beneath the Frozen World (colour 1977). Jacques Cousteau's Antarctic expedition looks at bird and animal life in the seas of Antarctica.

Penguins of Macquarie Island (colour, 1956). Shows king, gentoo, rockhopper and royal penguins. Distinguishing features, development, habits.

The Lonely Island (colour, 1956). Penguins, albatrosses and sea lions filmed on Macquarie Island.

The Year of the Kings (colour, 1978). Follows the annual breeding cycle of king penguins on Macquarie Island - nesting, hatching, the chicks, out to sea.

To the Island (colour, 1972). Wildlife on Macquarie Island, including penguins.

The Water of Life (colour, 1982). Antarctica is a unique laboratory for the study of simple life forms. Its oceans hold a vast, untapped food supply. Can it be exploited without damage to the ecosystem? NZ film from the **Big Ice** series.

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Above the Snow (colour, 1974). Planning and erection of Casey station in 1969, and life and scientific work there.

Amery Ice Shelf (colour, 1973). In 1968-69 four Australians spent a year on the ice doing glaciological research. This is their story.

Antarctic (colour, 1976). Film by the US National Science Foundation showing international scientific research in Antarctica.

Antarctica (colour, 1980). A look at the life and work at Scott Base, and New Zealand's work in Antarctica.

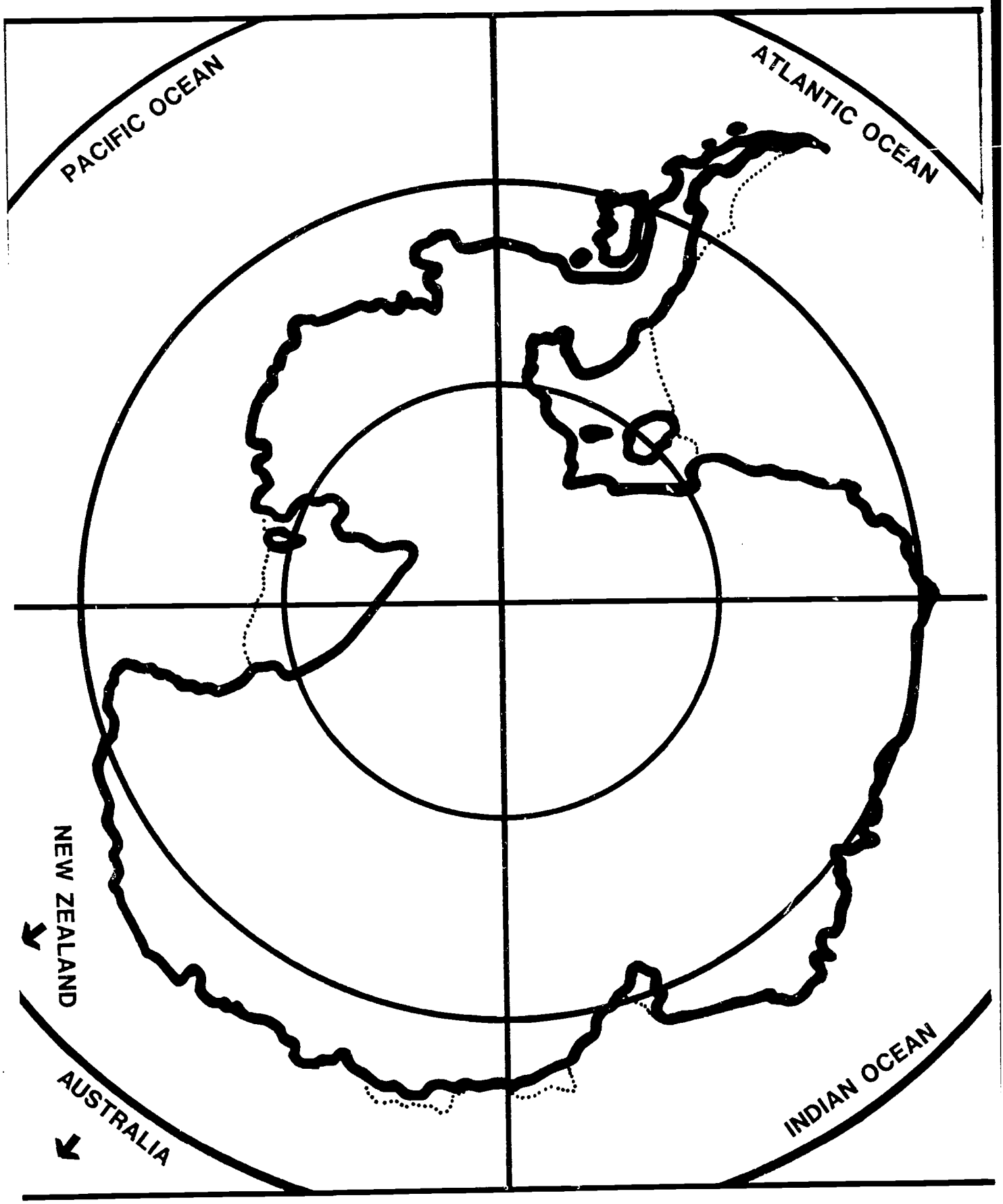
Australian Research in Antarctica (colour, 1975). Aspects of scientific research and fieldwork carried out by the Antarctic Division - medicine, glaciology, biology, physics.

Broken Silence (colour, 1971). Scientific work by an Australian party in the isolated Prince Charles Mountains. Contact with base is by radio and aircraft, but all depends on the changeable Antarctic weather.

Casey, Antarctica (colour, 1980). Brief history of Australian involvement in Antarctica. Shows life at Casey, an overland scientific traverse and biological research on the coast near the base.

Douglas Mawson: The Survivor (colour, 1982). Documentary reconstruction of Mawson's 1912 expedition on which Ninnes and Mertz died. Interviews with Mawson's daughter, his contemporaries and students.

Twelve Flags South (black and white, 1963) Details of scientific work in Antarctica by researchers of twelve nations.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