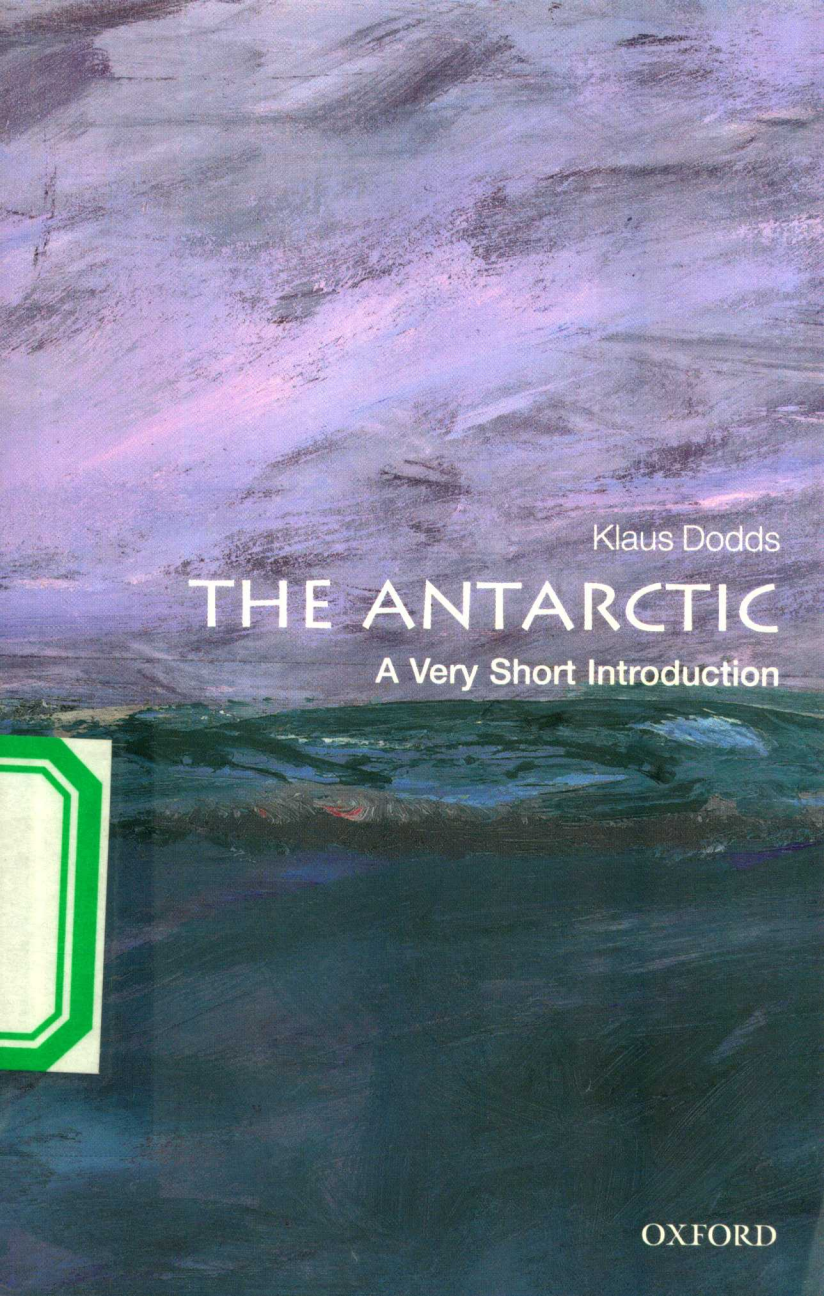

Klaus Dodds
THE ANTARCTIC
A Very Short Introduction
OXFORD

Klaus Dodds

THE ANTARCTIC

A Very Short Introduction

OXFORD
UNIVERSITY PRESS

OXFORD
UNIVERSITY PRESS

Great Clarendon Street, Oxford ox2 6DP,
United Kingdom

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide. Oxford is a registered trade mark of
Oxford University Press in the UK and in certain other countries

First Edition published in 2012
Impression: 1

British Library Cataloguing in Publication Data
Data available

Library of Congress Cataloging in Publication Data
Data available

ISBN 978-0-19-969768-7

Printed in Great Britain
on acid-free paper by
Ashford Colour Press Ltd, Gosport, Hampshire

VERY SHORT INTRODUCTIONS are for anyone wanting a stimulating and accessible way in to a new subject. They are written by experts, and have been published in more than 25 languages worldwide.

The series began in 1995, and now represents a wide variety of topics in history, philosophy, religion, science, and the humanities. The VSI Library now contains more than 300 volumes—a Very Short Introduction to everything from ancient Egypt and Indian philosophy to conceptual art and cosmology—and will continue to grow in a variety of disciplines.

Very Short Introductions available now:

ADVERTISING Winston Fletcher
AFRICAN HISTORY
John Parker and Richard Rathbone
AGNOSTICISM Robin Le Poidevin
AMERICAN IMMIGRATION
David A. Gerber
AMERICAN POLITICAL PARTIES
AND ELECTIONS L. Sandy Maisel
THE AMERICAN PRESIDENCY
Charles O. Jones
ANAESTHESIA Aidan O'Donnell
ANARCHISM Colin Ward
ANCIENT EGYPT Ian Shaw
ANCIENT GREECE Paul Cartledge
ANCIENT PHILOSOPHY Julia Annas
ANCIENT WARFARE
Harry Sidebottom
ANGELS David Albert Jones
ANGLICANISM Mark Chapman
THE ANGLO-SAXON AGE John Blair
THE ANIMAL KINGDOM
Peter Holland
ANIMAL RIGHTS David DeGrazia
THE ANTARCTIC Klaus Dodds
ANTISEMITISM Steven Beller
ANXIETY
Daniel Freeman and Jason Freeman
THE APOCRYPHAL GOSPELS
Paul Foster
ARCHAEOLOGY Paul Bahn
ARCHITECTURE Andrew Ballantyne
ARISTOCRACY William Doyle
ARISTOTLE Jonathan Barnes
ART HISTORY Dana Arnold
ART THEORY Cynthia Freeland
ATHEISM Julian Baggini
AUGUSTINE Henry Chadwick
AUSTRALIA Kenneth Morgan
AUTISM Uta Frith
THE AZTECS Davíd Carrasco
BARTHES Jonathan Culler
BEAUTY Roger Scruton
BESTSELLERS John Sutherland
THE BIBLE John Riches
BIBLICAL ARCHAEOLOGY
Eric H. Cline
BIOGRAPHY Hermione Lee
THE BLUES Elijah Wald
THE BOOK OF MORMON
Terryl Givens
THE BRAIN Michael O'Shea
BRITISH POLITICS Anthony Wright
BUDDHA Michael Carrithers
BUDDHISM Damien Keown
BUDDHIST ETHICS Damien Keown
CANCER Nicholas James
CAPITALISM James Fulcher
CATHOLICISM Gerald O'Collins
THE CELL
Terence Allen and Graham Cowling
THE CELTS Barry Cunliffe
CHAOS Leonard Smith
CHILDREN'S LITERATURE
Kimberley Reynolds
CHINESE LITERATURE Sabina Knight
CHOICE THEORY Michael Allingham
CHRISTIAN ART Beth Williamson
CHRISTIAN ETHICS D. Stephen Long

CHRISTIANITY Linda Woodhead
CITIZENSHIP Richard Bellamy
CLASSICAL MYTHOLOGY
Helen Morales
CLASSICS
Mary Beard and John Henderson
CLAUSEWITZ Michael Howard
THE COLD WAR Robert McMahon
COLONIAL LATIN AMERICAN
LITERATURE Rolena Adorno
COMMUNISM Leslie Holmes
THE COMPUTER Darrel Ince
THE CONQUISTADORS
Matthew Restall and
Felipe Fernández-Armesto
CONSCIENCE Paul Strohm
CONSCIOUSNESS Susan Blackmore
CONTEMPORARY ART
Julian Stallabrass
CONTINENTAL PHILOSOPHY
Simon Critchley
COSMOLOGY Peter Coles
CRITICAL THEORY
Stephen Eric Bronner
THE CRUSADES Christopher Tyerman
CRYPTOGRAPHY
Fred Piper and Sean Murphy
THE CULTURAL REVOLUTION
Richard Curt Kraus
DADA AND SURREALISM
David Hopkins
DARWIN Jonathan Howard
THE DEAD SEA SCROLLS
Timothy Lim
DEMOCRACY Bernard Crick
DERRIDA Simon Glendinning
DESCARTES Tom Sorell
DESERTS Nick Middleton
DESIGN John Heskett
DEVELOPMENTAL BIOLOGY
Lewis Wolpert
THE DEVIL Darren Oldridge
DICTIONARIES Lynda Mugglestone
DINOSAURS David Norman
DIPLOMACY Joseph M. Siracusa
DOCUMENTARY FILM
Patricia Aufderheide
DREAMING J. Allan Hobson
DRUGS Leslie Iversen
DRUIDS Barry Cunliffe
EARLY MUSIC Thomas Forrest Kelly
THE EARTH Martin Redfern
ECONOMICS Partha Dasgupta
EGYPTIAN MYTH Geraldine Pinch
EIGHTEENTH-CENTURY
BRITAIN Paul Langford
THE ELEMENTS Philip Ball
EMOTION Dylan Evans
EMPIRE Stephen Howe
ENGELS Terrell Carver
ENGINEERING David Blockley
ENGLISH LITERATURE
Jonathan Bate
ENVIRONMENTAL ECONOMICS
Stephen Smith
EPIDEMIOLOGY Rodolfo Saracci
ETHICS Simon Blackburn
THE EUROPEAN UNION
John Pinder and Simon Usherwood
EVOLUTION
Brian and Deborah Charlesworth
EXISTENTIALISM Thomas Flynn
FASCISM Kevin Passmore
FASHION Rebecca Arnold
FEMINISM Margaret Walters
FILM Michael Wood
FILM MUSIC Kathryn Kalinak
THE FIRST WORLD WAR
Michael Howard
FOLK MUSIC Mark Slobin
FORENSIC PSYCHOLOGY
David Canter
FORENSIC SCIENCE Jim Fraser
FOSSILS Keith Thomson
FOUCAULT Gary Gutting
FREE SPEECH Nigel Warburton
FREE WILL Thomas Pink
FRENCH LITERATURE John D. Lyons
THE FRENCH REVOLUTION
William Doyle
FREUD Anthony Storr
FUNDAMENTALISM Malise Ruthven
GALAXIES John Gribbin
GALILEO Stillman Drake
GAME THEORY Ken Binmore
GANDHI Bhikhu Parekh
GENIUS Andrew Robinson
GEOGRAPHY
John Matthews and David Herbert
GEOPOLITICS Klaus Dodds

GERMAN LITERATURE
Nicholas Boyle
GERMAN PHILOSOPHY
Andrew Bowie
GLOBAL CATASTROPHES
Bill McGuire
GLOBAL ECONOMIC HISTORY
Robert C. Allen
GLOBAL WARMING Mark Maslin
GLOBALIZATION Manfred Steger
THE GREAT DEPRESSION AND THE NEW DEAL
Eric Rauchway
HABERMAS James Gordon Finlayson
HEGEL Peter Singer
HEIDEGGER Michael Inwood
HERODOTUS Jennifer T. Roberts
HIEROGLYPHS Penelope Wilson
HINDUISM Kim Knott
HISTORY John H. Arnold
THE HISTORY OF ASTRONOMY
Michael Hoskin
THE HISTORY OF LIFE
Michael Benton
THE HISTORY OF MATHEMATICS Jacqueline Stedall
THE HISTORY OF MEDICINE
William Bynum
THE HISTORY OF TIME
Leofranc Holford-Strevens
HIV/AIDS Alan Whiteside
HOBBES Richard Tuck
HUMAN EVOLUTION Bernard Wood
HUMAN RIGHTS Andrew Clapham
HUMANISM Stephen Law
HUME A. J. Ayer
IDEOLOGY Michael Freeden
INDIAN PHILOSOPHY Sue Hamilton
INFORMATION Luciano Floridi
INNOVATION
Mark Dodgson and David Gann
INTELLIGENCE Ian J. Deary
INTERNATIONAL MIGRATION
Khalid Koser
INTERNATIONAL RELATIONS
Paul Wilkinson
ISLAM Malise Ruthven
ISLAMIC HISTORY Adam Silverstein
ITALIAN LITERATURE
Peter Hainsworth and David Robey
JESUS Richard Bauckham
JOURNALISM Ian Hargreaves
JUDAISM Norman Solomon
JUNG Anthony Stevens
KABBALAH Joseph Dan
KAFKA Ritchie Robertson
KANT Roger Scruton
KEYNES Robert Skidelsky
KIERKEGAARD Patrick Gardiner
THE KORAN Michael Cook
LANDSCAPES AND GEOMORPHOLOGY
Andrew Goudie and Heather Viles
LANGUAGES Stephen R. Anderson
LATE ANTIQUITY Gillian Clark
LAW Raymond Wacks
THE LAWS OF THERMODYNAMICS
Peter Atkins
LEADERSHIP Keith Grint
LINCOLN Allen C. Guelzo
LINGUISTICS Peter Matthews
LITERARY THEORY Jonathan Culler
LOCKE John Dunn
LOGIC Graham Priest
MACHIAVELLI Quentin Skinner
MADNESS Andrew Scull
MAGIC Owen Davies
MAGNA CARTA Nick Vincent
MAGNETISM Stephen Blundell
THE MARQUIS DE SADE John Phillips
MARTIN LUTHER Scott H. Hendrix
MARX Peter Singer
MATHEMATICS Timothy Gowers
THE MEANING OF LIFE
Terry Eagleton
MEDICAL ETHICS Tony Hope
MEDIEVAL BRITAIN
John Gillingham and Ralph A. Griffiths
MEMORY Jonathan K. Foster
MICHAEL FARADAY Frank A. J. L. James
MODERN ART David Cottington
MODERN CHINA Rana Mitter
MODERN FRANCE
Vanessa R. Schwartz
MODERN IRELAND Senia Pašeta
MODERN JAPAN
Christopher Goto-Jones
MODERN LATIN AMERICAN LITERATURE
Roberto González Echevarría

MODERNISM Christopher Butler
MOLECULES Philip Ball
THE MONGOLS Morris Rossabi
MORMONISM
Richard Lyman Bushman
MUHAMMAD Jonathan A. C. Brown
MULTICULTURALISM Ali Rattansi
MUSIC Nicholas Cook
MYTH Robert A. Segal
NATIONALISM Steven Grosby
NELSON MANDELA Elleke Boehmer
NEOLIBERALISM
Manfred Steger and Ravi Roy
THE NEW TESTAMENT
Luke Timothy Johnson
THE NEW TESTAMENT AS
LITERATURE Kyle Keefer
NEWTON Robert Iliffe
NIETZSCHE Michael Tanner
NINETEENTH-CENTURY BRITAIN
Christopher Harvie and
H. C. G. Matthew
THE NORMAN CONQUEST
George Garnett
NORTH AMERICAN INDIANS
Theda Perdue and Michael D. Green
NORTHERN IRELAND
Marc Mulholland
NOTHING Frank Close
NUCLEAR POWER Maxwell Irvine
NUCLEAR WEAPONS
Joseph M. Siracusa
NUMBERS Peter M. Higgins
OBJECTIVITY Stephen Gaukroger
THE OLD TESTAMENT
Michael D. Coogan
ORGANIZATIONS Mary Jo Hatch
PAGANISM Owen Davies
PARTICLE PHYSICS Frank Close
PAUL E. P. Sanders
PENTECOSTALISM William K. Kay
THE PERIODIC TABLE Eric R. Scerri
PHILOSOPHY Edward Craig
PHILOSOPHY OF LAW
Raymond Wacks
PHILOSOPHY OF SCIENCE
Samir Okasha
PHOTOGRAPHY Steve Edwards
PLAGUE Paul Slack
PLANETS David A. Rothery
PLANTS Timothy Walker
PLATO Julia Annas
POLITICAL PHILOSOPHY
David Miller
POLITICS Kenneth Minogue
POSTCOLONIALISM Robert Young
POSTMODERNISM Christopher Butler
POSTSTRUCTURALISM
Catherine Belsey
PREHISTORY Chris Gosden
PRESOCRATIC PHILOSOPHY
Catherine Osborne
PRIVACY Raymond Wacks
PROBABILITY John Haigh
PROGRESSIVISM Walter Nugent
PROTESTANTISM Mark A. Noll
PSYCHIATRY Tom Burns
PSYCHOLOGY
Gillian Butler and Freda McManus
PURITANISM Francis J. Bremer
THE QUAKERS Pink Dandelion
QUANTUM THEORY
John Polkinghorne
RACISM Ali Rattansi
THE REAGAN REVOLUTION Gil Troy
REALITY Jan Westerhoff
THE REFORMATION Peter Marshall
RELATIVITY Russell Stannard
RELIGION IN AMERICA
Timothy Beal
THE RENAISSANCE Jerry Brotton
RENAISSANCE ART
Geraldine A. Johnson
RISK Baruch Fischhoff and John Kadvany
RIVERS Nick Middleton
ROMAN BRITAIN Peter Salway
THE ROMAN EMPIRE
Christopher Kelly
ROMANTICISM Michael Ferber
ROUSSEAU Robert Wokler
RUSSELL A. C. Grayling
RUSSIAN HISTORY Geoffrey Hosking
RUSSIAN LITERATURE Catriona Kelly
THE RUSSIAN REVOLUTION
S. A. Smith
SCHIZOPHRENIA
Chris Frith and Eve Johnstone
SCHOPENHAUER Christopher Janaway
SCIENCE AND RELIGION
Thomas Dixon

SCIENCE FICTION David Seed
THE SCIENTIFIC REVOLUTION
Lawrence M. Principe
SCOTLAND Rab Houston
SEXUALITY Véronique Mottier
SHAKESPEARE Germaine Greer
SIKHISM Eleanor Nesbitt
SLEEP
Steven W. Lockley and Russell G. Foster
SOCIAL AND CULTURAL
ANTHROPOLOGY
John Monaghan and Peter Just
SOCIALISM Michael Newman
SOCIOLOGY Steve Bruce
SOCRATES C. C. W. Taylor
THE SOVIET UNION
Stephen Lovell
THE SPANISH CIVIL WAR
Helen Graham
SPANISH LITERATURE
Jo Labanyi
SPINOZA Roger Scruton
STARS Andrew King
STATISTICS David J. Hand
STEM CELLS Jonathan Slack
STUART BRITAIN John Morrill
SUPERCONDUCTIVITY
Stephen Blundell
TERRORISM Charles Townshend
THEOLOGY David F. Ford
THOMAS AQUINAS Fergus Kerr
TOCQUEVILLE Harvey C. Mansfield
TRAGEDY Adrian Poole
THE TUDORS John Guy
TWENTIETH-CENTURY BRITAIN
Kenneth O. Morgan
THE UNITED NATIONS
Jussi M. Hanhimäki
THE U.S. CONGRESS Donald A. Ritchie
THE U.S. SUPREME COURT
Linda Greenhouse
UTOPIANISM Lyman Tower Sargent
THE VIKINGS Julian Richards
VIRUSES Dorothy H. Crawford
WITCHCRAFT Malcolm Gaskill
WITTGENSTEIN A. C. Grayling
WORLD MUSIC Philip Bohlman
THE WORLD TRADE
ORGANIZATION
Amrita Narlikar
WRITING AND SCRIPT
Andrew Robinson

Available soon:

RADIOACTIVITY Claudio Tuniz
THE ROMAN REPUBLIC
David Gwynn
TRUST Katherine Hawley
METAPHYSICS Stephen Mumford
ROBOTICS Alan Winfield

For more information visit our website
www.oup.com/vsi/

Contents

Chapter 1
Defining the Antarctic

The German geophysicist Alfred Wegener (1880–1930) developed the theory of continental drift, which postulated that the Antarctic was part of an ancient super-continent called Pangaea. Created some 300 million years ago, this super-continent broke up 100 million years later to establish the current configuration of continents. Publicly articulated in 1912, the year of Captain Robert Scott and his party's demise in the Antarctic, Wegener's thesis was made possible in part by educated guesswork but also through accumulating knowledge of the continents, and their underlying geology. The Antarctic continent was the last to be discovered by humans even if its presence was postulated far earlier. In 1773/4, the British explorer Captain James Cook saw at first hand the potential for an additional landmass. Over the following hundred years, outlying islands and the coastal portion of the Antarctic was sighted, charted, and partially explored.

Ushering in a new era of continental exploration and international rivalry, the Antarctic is now as much a symbol of global anxiety (with associated rescue fantasies), as it is a site of ongoing scientific collaboration and knowledge exchange – snow, ice, and the cold are new geopolitical and scientific front lines.

Tracing the Antarctic

The Antarctic has been defined and delineated with reference to latitude, climatic characteristics, ecological qualities, political and legal boundaries, as well as through appeals to its sublime wilderness and endangerment. There is some congruence between these spatial definitions but also important gaps. Some definitions are more tightly defined while others emphasize how the Antarctic might be thought of in more elastic, even fuzzy, terms.

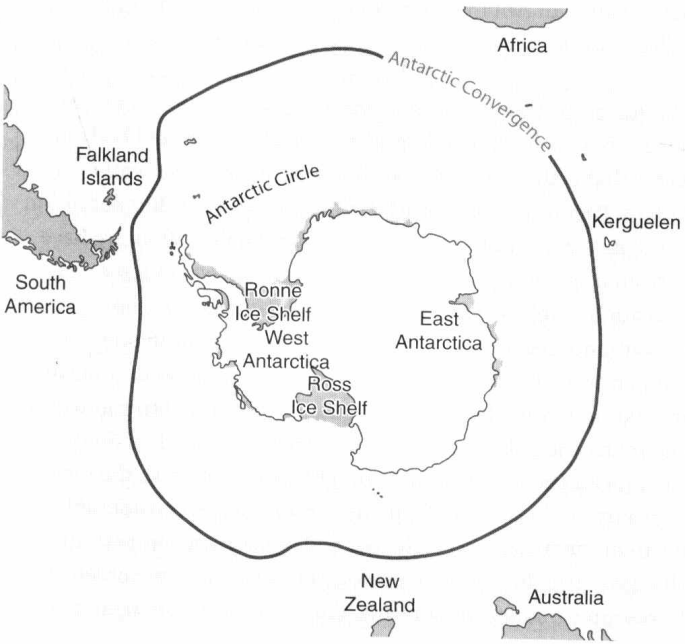
Defining the sub-Antarctic

This refers in the main to island groups that lie close and sometimes north of the Antarctic Convergence – where the colder waters of the Southern Ocean meet the warmer waters of the Atlantic, Pacific, and Indian Oceans. These groups include Bouvet Island, the Kerguelen Islands, and the South Sandwich Islands. Unlike the Antarctic continent, countries such as Britain, France, Australia, New Zealand, and South Africa exercise sovereignty over these islands. Thus, they are in the main subject to undisputed territorial seas, exclusive economic zones, and continental shelf rights.

However, the ownership of some sub-Antarctic islands, such as South Georgia and South Sandwich, are disputed, in this case involving a long-standing disagreement between Britain and Argentina. In April 1982, the two countries were drawn into conflict over South Georgia and, further to the north, the Falkland Islands/Islas Malvinas. There are other islands, which are not considered sub-Antarctic *sensu stricto*, for example Southern Oceanic islands such as Gough and Auckland.

The Antarctic as an area, according to geographical convention at least, refers to everything below the *Antarctic Circle*, including ice shelves and water. The Antarctic Circle is distinguished from

Antarctica, which refers to the landmass that is the southern polar continent. While the two terms are often used interchangeably, this is a fundamental distinction, as the area south of the Antarctic Circle (defined as 66°S of the Equator) experiences at least one day of continuous daylight every year (the December solstice), and a corresponding period of continuous night-time at least once per year (the June solstice). When it comes to the governance of the Antarctic, the *Antarctic Convergence* (see Figure 1) has also been used to manage activities such as fishing.



1. The Antarctic Convergence represents an important climatic boundary between air and water masses, and is also an approximate boundary for the Southern Ocean, surrounding the Antarctic continent. The water around the land mass is cold and with a slightly lower salinity than north of the convergence zone. The area is also rich in nutrients, providing a key support for the ecosystems in the Southern Ocean

Geographical latitude is only one possible register of the Antarctic. For the Swedish geologist Otto Nordenskjold, writing in 1928, the polar regions were defined by their coldness. Characterized as desert-like, with annual precipitation of only 200 millimetres along the coast and less in the interior, only specially adapted plant and animal life was thought to be able to endure. As Nordenskjold concluded, 'Nowhere on earth is nature so completely and directly characterized by the daily regular weather – by what we might call the normal climate – as in the polar lands.' Temperatures in the interior of the continent can be as low as -50 °C and, at their very worst, -89 °C, recorded at the Soviet/Russian Antarctic research station on the polar plateau called Vostok.

The Antarctic Convergence (sometimes termed the 'Antarctic polar front' or the 'polar frontal zone'), where the cold body of water that is the Southern Ocean meets the warmer waters of the Indian, Pacific, and Atlantic Oceans, provides another definition of the Antarctic. Rather than a latitudinal delineation, we have here an oceanographic/climatic frontier that acts as a zone of transition emphasizing movement and connection. The convergence itself varies from year to year, depending on sea temperature and climatic trends. So these are flows that make, remake, and unmake a zone of some 30–50 kilometres in width, encircling the polar continent, and stretching north of South Georgia and Bouvet Island. It roughly coincides with the mean February isotherm (10°C) and lies around 58°S, considerably north of the Antarctic Circle. Air and sea surface temperatures change markedly once one crosses the Antarctic Convergence. In resource management terms, the Antarctic Convergence is significant because of the wealth of marine life, especially plankton and shrimp-like krill – the food of choice of birds, fish, and whales – that is found there. As such, it also means that fishing stocks and sea birds tend to be concentrated around the Antarctic Convergence, leading to greater interest in managing these areas of the Southern Ocean.

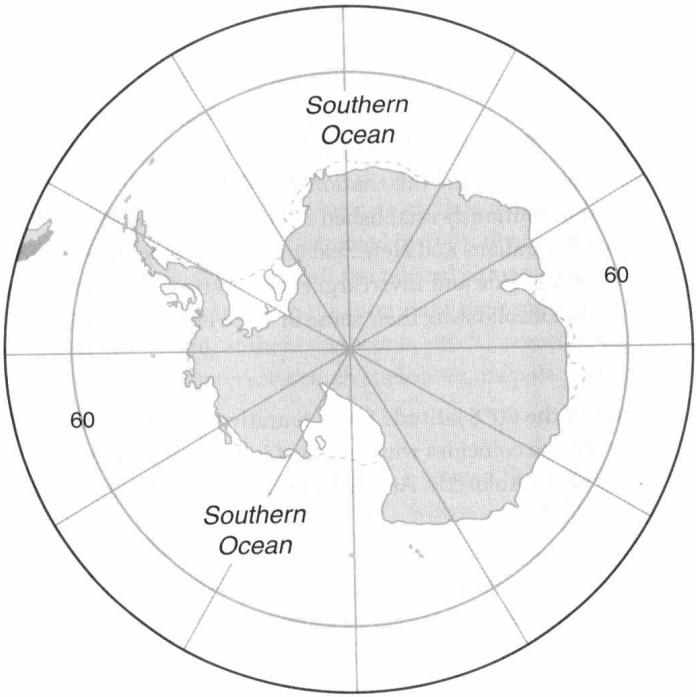
Unlike the zonal qualities of the Antarctic Convergence, the Southern Ocean is often defined as being south of 60°S latitude, and thus encircling the continent. There is a disagreement, however. Does the Southern Ocean possess a more northerly boundary? While Captain James Cook used the term to describe the vast seas of 50°S, the International Hydrographic Organization cautiously established the boundary at 60°S in 2000. For Australians and New Zealanders, however, the water off the cities of Adelaide and Invercargill are the start of the Southern Ocean, thus consolidating their sense of these cities as 'Antarctic gateways'.

The usage of the 60°S latitude for its tentative definition of the Southern Ocean coincides with the most important political definition of the Antarctic. Article VI of the 1959 Antarctic Treaty notes:

> 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.

This area of application entered into force in June 1961.

These lines and zones are just one way of tracing the Antarctic. In a more imaginative sense, we might acknowledge appeals to the sublime and wilderness. For 19th- and 20th-century explorers and scientists, the Antarctic was as much traced via the sublime as it was tentatively mapped and charted. As a literary expression, this notion refers to the capacity of things in nature to overwhelm the human mind by their sheer grandeur and immense possibility. A place or landscape might, as a consequence, inspire awe or provoke terror. So the sublime refers to something beyond the calculable and measurable, and more to a state of mind. The Antarctic in this particular sense is a true frontier of the human,



2. The Antarctic Treaty's Zone of Application

and a testing ground of men in particular. Apsley Cherry-Gerrard's memoir of Scott's last expedition, *The Worst Journey in the World* (1922), memorably referred to the Antarctic as a place of privation and suffering. As he noted caustically, 'Polar exploration is at once the cleanest and most isolated way of having a bad time which has been devised.' But it could also be compelling, as Cherry-Gerrard noted, 'And I tell you, if you have the desire for knowledge and the power to give it physical expression, go out and explore.'

The notion that the Antarctic landmass should be defined by its wilderness qualities is explicitly noted in Article 3 of the 1991

Protocol on Environmental Protection, which demands that Antarctic Treaty Consultative Parties (ATCP) commit themselves to the 'protection of the Antarctic environment... and the intrinsic value of Antarctica, including its wilderness and aesthetic values'. As well as for its own sake, Antarctica's wilderness values matter when considered as part of an ongoing global debate about the fate of the planet. Recent television programmes (e.g. the BBC's *Frozen Planet*), films (e.g. *The March of the Penguins*), music (e.g. Peter Maxwell Davies's *Antarctic Symphony*), art (e.g. Anne Noble's *British Petroleum Map*), and novels (e.g. Kim Stanley Robinson's *Antarctica*) suggest that the idea of the Antarctic landmass as wilderness provokes fascination, but also anxiety about what damage we might be doing as a human community to it. Are economic and ecological meltdown co-producing one another?

Thus, as we ponder some of the region's diverse human and physical geographies, our regional scope will extend northwards of the Antarctic Circle to encompass the northern tip of the Antarctic Peninsula, and islands such as Campbell, Prince Edward Islands, South Orkneys, and South Georgia, as well as the Southern Ocean. When we consider the Antarctic more broadly, whether it be culturally, economically, politically, or environmentally, our terms of reference will need to be ever more flexible to acknowledge bi-polar, global, and even extra-terrestrial connections, including the Moon (for parallels with Earth).

Making and unmaking the Antarctic

A satellite composite image of the Antarctic, a rather recent representation of the region, reveals a continent composed of two parts – East and West Antarctica with the western section characterized by a serpentine tail pointing towards the southern tip of the South American continent. The Southern Ocean is far removed from other continents and accompanying centres of population. The continent itself encompasses some 14,000,000

square kilometres, some 6,000,000 square kilometres larger than the United States. The coastline encompasses nearly 18,000 kilometres and is composed of a mixture of ice shelves, ice walls, rock and ice streams. The Antarctic ice sheet covers about 98% of Antarctica, and is on average 1.6 kilometres thick and some 25 million cubic kilometres in volume. The continent contains 90% of the world's ice and 70% of the world's fresh water. If the ice sheet was to melt in its entirety, then sea water levels would, it is believed, rise by some 60 metres, with devastating consequences for lower-lying regions around the world.

But this satellite image, however striking, is misleading. The Antarctic is the world's most unstable space, with extraordinary changes being recorded every year in terms of snow accumulation and sea ice extent. The satellite image literally freeze frames. Every September, in the late winter period, the size of the continent effectively doubles. A large area of the Southern Ocean extending more than 1,000 kilometres from the coastline is temporarily covered in sea ice. This capacity to alter has, over time, played havoc with attempts to map and chart the Antarctic. Countless explorers and mariners have discovered to their cost that existing maps are hopelessly inaccurate, and that there is a rich tradition of islands and coastlines being in the 'wrong place' or simply 'disappearing'.

Geologically, the Antarctic has a long and complex history, its composition ranging from Precambrian crystalline rock to glacial deposits of a recent vintage. Some of the world's oldest rock is found in the Antarctic, dating back some three billion years. Geological evidence suggests that the Antarctic has not always been characterized by the snow and cold; it was, for much of its history, a green continent. Sedimentary rocks, to be found in the Antarctic Peninsula region, reveal fossilized tropical ferns and pollen specimens, while coal deposits in the Trans-Antarctic Mountains suggests a climate favouring temperate vegetation. In the Cambrian era (590 to 505 million years ago), what we now term Antarctica