



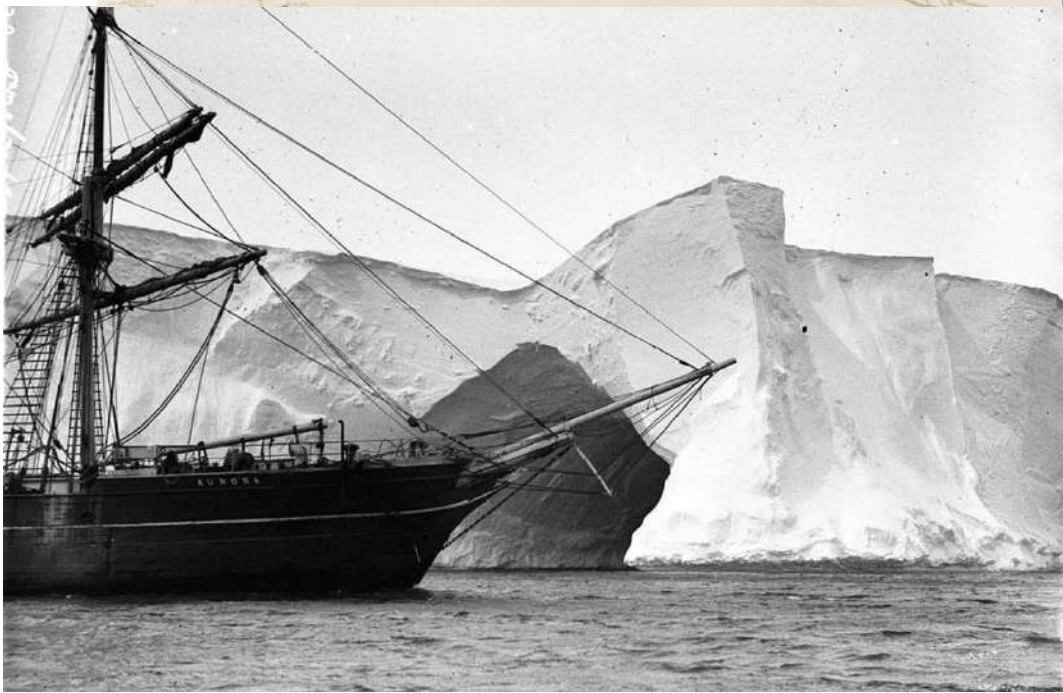
Coal in Antarctica

An unignited history

Alessandro Antonello

Associate Professor in
Environmental History

University of Tasmania
September 2026

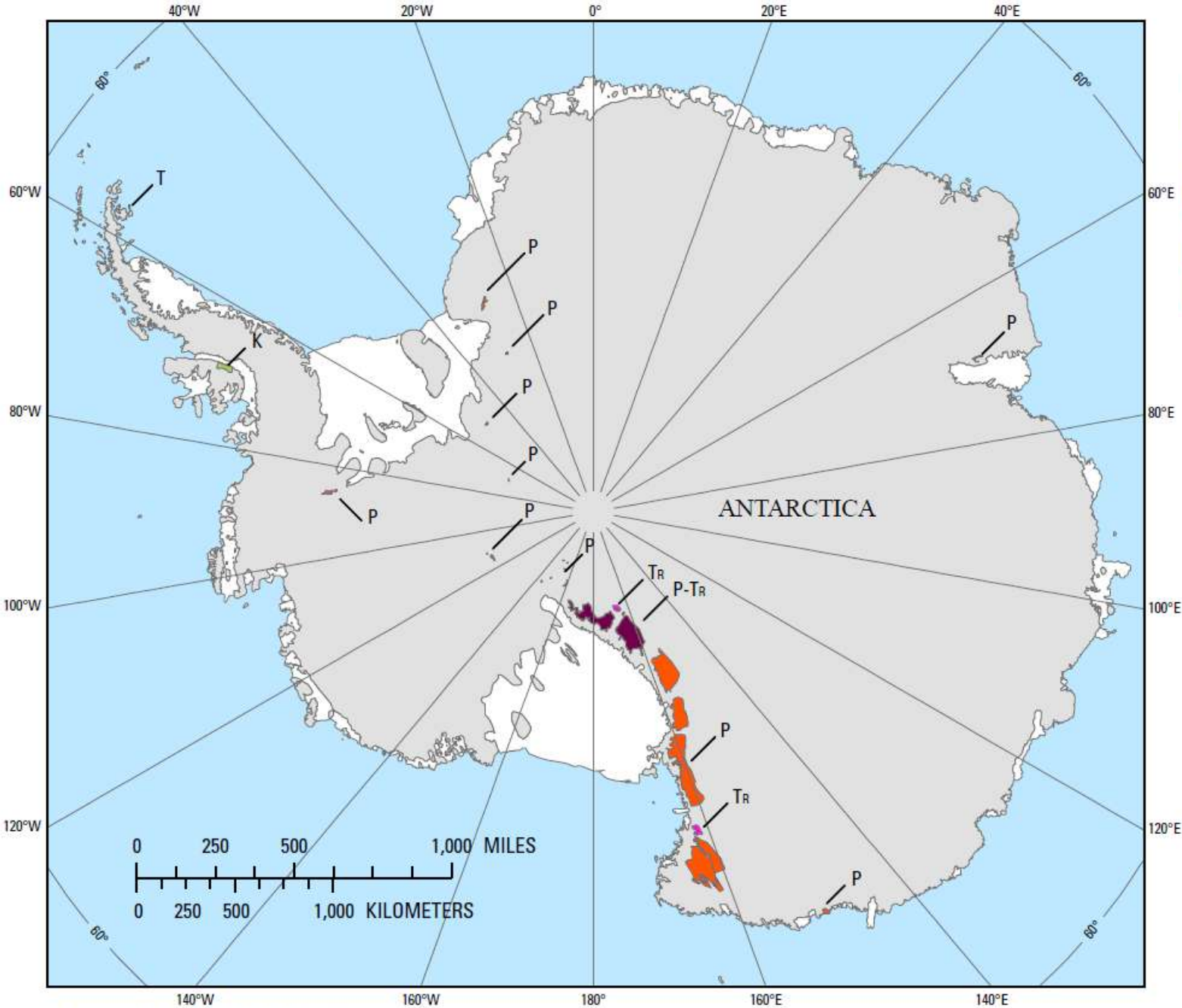




ASSEMBLING AN
INTERNATIONAL ENVIRONMENT

THE
GREENING
OF
ANTARCTICA

ALESSANDRO ANTONELLO



EXPLANATION

Coal-bearing geologic units

- T Tertiary (Paleocene to Eocene)
- K Cretaceous
- Tr Triassic
- P-Tr Permian to Triassic
- P Permian

- Ocean water
- Ice shelf
- Ice, snowpack, or non-coal-bearing geologic unit



GIS Representation of Coal-Bearing Areas in Antarctica

By Matthew D. Merrill

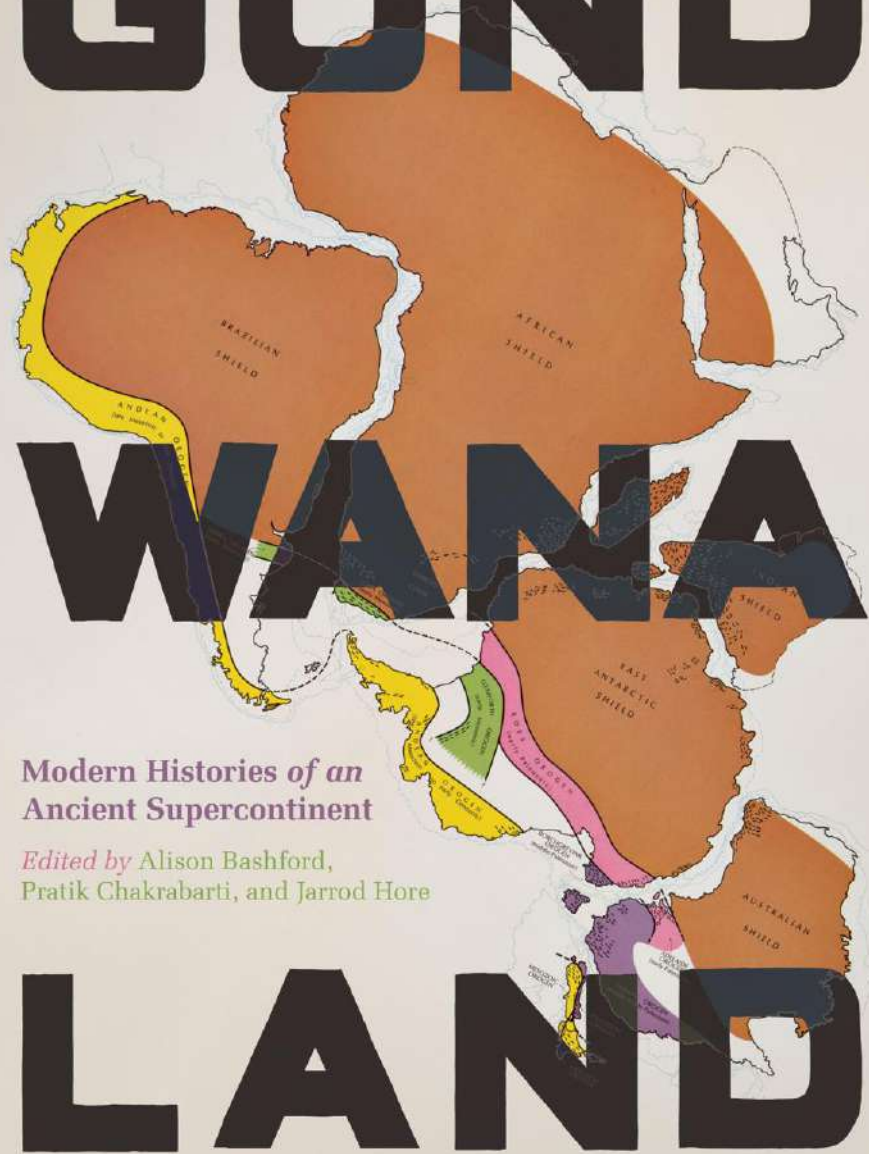
GOND

WAN

LAND

Modern Histories of an Ancient Supercontinent

Edited by Alison Bashford,
Pratik Chakrabarti, and Jarrod Hore



3

Antarctica and Gondwanaland

Sutures and Futures

Alessandro Antonello

The modern continent of Antarctica and the ancient supercontinent of Gondwanaland accompanied each other across their twentieth-century emergence and figuration in science, culture, and geopolitics. Both were emergent geocultural entities at the end of the nineteenth century, products of imaginative as much as of material encounters. Knowledge about the two landmasses was gained and refined across the twentieth century, as an explosion of scientific, exploratory, and cultural work outlined their contours, narrated their histories, created institutions devoted to knowing and managing them, and speculated about their futures. By the century's end a range of consilient and contradictory interpretations of the continents had proliferated.

In his 1937 magnum opus, *Our Wandering Continents*, the South African geologist and leading advocate of continental drift theory Alexander du Toit called Antarctica the “key-piece” of Gondwanaland, “around which . . . the remaining ‘puzzle-pieces’ . . . can with remarkable precision be fitted” (see chap. 5).¹ Given the fragmented modern histories of Gondwanaland, there is no single “key” to unlock all its genealogies—Antarctica certainly cannot be such a key. It was not only southern geologists and other southern actors who enrolled



DISCOVERY OF COAL

by the rocks of the island we are passing, and there left everything except the barest necessities. After dinner to-night Wild went up the hill-side in order to have a look at the plateau. He came down with the news that the plateau is in sight at last, and that to-morrow should see us at the end of our difficulties. He also brought down with him some very interesting geological specimens, some of which certainly look like coal. The quality may be poor, but I have little doubt that the stuff is coal. If that proves to be the case, the discovery will be most interesting to the scientific world. Wild tells me that there are about six seams of this dark stuff, mingled with sandstone, and that the seams are from 4 in. to 7 or 8 ft. in thickness. There are vast quantities of it lying on the hill-side. We took a photograph of the sandstone, and I wish very much that we could spare time to examine the rocks more thoroughly. We may be able to do this on the way back. We have but little time for geological work, for our way is south and time is short, but we found that the main rock is sandstone and on our way back we will collect some. I expect that this will be the most southerly rock that we shall obtain, for we ought to reach the plateau to-morrow, and then there will be no more land close to us. It is gusty to-night, but beautifully clear. The altitude, according to the hypsometer, is 6100 ft.

NOTE. When I showed the specimens to Professor David after our return to the *Nimrod*, he stated definitely that some of them were coal and others "mother of coal." The notes on geological matters in another chapter will deal more fully with this very interesting discovery.



BEACON SANDSTONE COAL MEASURES (GONDWANA) OF MOUNT BUCKLEY

A great nunatak at head of Beardmore Glacier. The steep slope of the glacier is obvious in the foreground



verment. The subsidy proposal has many advantages, which I can explain better by letter."

MR. FISHER RELENTLESS.

NOT MOVED BY PUBLIC MEETINGS.

"GYMPIE WILL TELL ALL."

MELBOURNE, Friday. This morning the Lord Mayor of Melbourne (Colonel Bursdon) forwarded to the Prime Minister (Mr. Fisher) a letter containing the text of the resolutions passed at the great meeting of Thursday night, asking to be favoured with an early reply to the subject of resolutions 2 and 3. Mr. Fisher promptly sent back the following reply:—

I have the honor to acknowledge the receipt of your letter of even date, conveying to me a copy of resolutions adopted at a public meeting of citizens last evening, with reference to the proposed presentation by the Commonwealth of Australia to the Imperial Government of a Dreadnought battleship, and asking the favour of an early reply to the subject of the second and third resolutions. I have much pleasure in replying at once, as the matter is an important one, and relates to policy. I beg to state that I shall fully deal with the issues raised in the various resolutions when I speak at Gympie on the 30th inst.

PERTH'S RESOLUTIONS.

LABOUR MAN HOWLED DOWN.

AN AWFUL UPROAR.

MEETING BREAKS UP IN DISORDER.

PERTH, Friday. The Perth Town Hall was packed to the doors last evening, when the public meeting convened by the Mayor was held to consider the proposal that the Commonwealth should give a Dreadnought to the British nation. From the outset it was apparent that there was a strongly organised section opposed to the objects of the meeting, which eventually degenerated into one of the worst fiascos in the history of public meetings in Perth. Nevertheless all the speeches for and against the main proposition were strongly Imperial. But the commotion was caused by a diversity of opinion as to how the Imperial sentiment should be evinced. The main resolution proposed was as follows:—"This public meeting of citizens of Perth recognises the gravity of the feeling that has been aroused throughout the Empire in regard to the adequacy of the navy, and the proposals of the Imperial Government for the future, and hereby resolves that the Federal Government be requested to immediately inform the home authorities that the people of Australia are prepared to make every necessary sacrifice to maintain the unquestioned supremacy of the motherland on the seas."

Sir John Forrest said they were face to face with a grave national problem. Ever since Nelson's great victory at Trafalgar England had been absolutely supreme on the seas, and they had not had a rival for the past hundred years. Had it not been for that victory Australia would not have been British to-day. For the first time during those hundred years their supremacy was menaced. He did not believe that there was any crisis (applause)—because Great Britain could afford a hundred Dreadnoughts if she wanted them. (Renewed cheers.) But if the Imperial navy lost the supremacy of the sea it must mean the dismemberment of the British Empire. Without naval supremacy they would be an empire of fragments, at the mercy of the nations. Australia might build destroyers, and might be able to resist invasion, but what about its trade and commerce on the ocean? He hoped and believed they were prepared to make sacrifices. Although he did not think there was anything desperate in the position of Great Britain to-day, still he rejoiced that the opportunity had arisen to show their great patriotism throughout the Empire. (Applause.)

fence of the Empire. When that was done the Empire was federated. (Hear, hear.) The more one reflected the more one wondered that Mr. Fisher should have lost an opportunity of making history in such a great way.

Professor Harrison Moore seconded the resolution, which was carried with acclamation. Mr. T. Prout Webb moved, and Lieut.-Colonel Brodribb seconded.—"That a copy of these resolutions be forwarded to the Prime Minister of the Commonwealth, and also to the Prime Ministers of the United Kingdom, Canada, the South African States, and New Zealand."

The motion was agreed to. It was stated by the chairman during the progress of the meeting that Mr. H. Berry had promised to contribute £100 if a subscription list were opened.

NEW ZEALAND'S ACTION.

CONGRATULATIONS FROM THE KING.

WELLINGTON, Friday. The Governor has received the following cable from the Secretary of State for the Colonies:—"I am commanded by the King to inform you that his Majesty is deeply gratified at the patriotic feeling displayed by New Zealand towards the mother country in the splendid offer, and to convey at once his gratitude and high appreciation for the fine patriotism and generosity shown in the magnificent offer made so promptly and spontaneously."

OTHER MESSAGES.

"VERY GREAT MORAL EFFECT."

WELLINGTON, Friday. The Prime Minister received a cable from Mr. Henniker Heaton offering his congratulations, and stating that he had been asked to advise Sir Joseph Ward that the members of his Majesty's Government had authorised him to say that New Zealand's patriotic offer had had a very great moral effect in the United Kingdom, and especially in foreign countries. It was specially valuable at the present time. The newspaper posters in the principal cities of the United Kingdom were headed "New Zealand's Generous and Patriotic Offer."

The Navy League cabled the local secretary of the Navy League its thanks to its countrymen in New Zealand for their splendid gift.

BRITISH GOVERNMENT'S VIEWS.

DESPATCH TO NEW ZEALAND.

AMPLE SECURITY AFFORDED.

WELLINGTON (N.Z.), Friday. The despatch of the Earl of Crewe, Secretary of State for the Colonies, to the Governor Lord Plunket, states:—"In view of the uncertainty as to the character and extent of the demand to be made on the national resources in the following year, New Zealand's offer is gratefully accepted. The British Government will consult the New Zealand Government regarding the time appropriate to give effect to the proposal. So far as the coming financial year is concerned, the powers and provisions asked in the Naval Estimates afford ample security."

FEDERAL MINISTRY SUPPORTED.

BY MELBOURNE TRADE UNIONISTS.

MELBOURNE, Friday. The Trades Hall Council to-night carried a resolution supporting the stand taken by the Federal Government in regard to the Dreadnought proposal. Three cheers were given for the Fisher Ministry.

FARTHEST SOUTH.

KING'S CONGRATULATIONS.

MESSAGE TO EXPEDITION.

LONDON, March 26.

The King has sent a message congratulating Lieutenant Shackleton and his comrades on the success of their expedition.

QUEEN'S CONGRATULATIONS.

MORE SCIENTIFIC RESULTS.

WONDERFUL ANIMALCULAE.

IN SUSPENDED ANIMATION.

HOW THE DOGS WORKED.

CHRISTCHURCH, Friday.

Lieut. Shackleton has received a sheet of congratulations, including the following message, sent on behalf of the Queen:—

Your telegram received this morning, which the Queen has read with interest. I have her Majesty's commands to say she will gladly receive back from you on your return to England the Union Jack entrusted to your charge, and which you have now made of such historic interest and value. I am further commanded to convey you the Queen's appreciation of your desire, which she gladly consents to, that the new range of mountains discovered by you in the far south should be named after her Majesty.

(Signed) DAUGHTON PROBYN.

Mr. James Murray, biologist, states that the most interesting part of the work was among the microscopic animals in the fresh water lakes, some of which only thaw once in many years. They found that certain specimens of the rotifer class lived in a state of suspended animation in the solid ice for two or three years. When thawed out they continued their habits of life as though nothing untoward had occurred. Experiments showed that these microscopic creatures were unaffected by a temperature of 40 deg. below zero, and at a temperature of 200 deg. he placed some in sea water, and in even a stronger solution of salt and water. This did not kill them. He kept a number in test tubes, which he thawed out regularly every week. As soon as the water was thawed the creatures immediately began to feed on the lichens to which they were attached. He found previously unknown specimens of lice upon a M'Cormick skua and an Emperor penguin.

"All the discoveries I made," Mr. Murray continued, "indicate that the Antarctic country has been long isolated from any other part of the globe, because even the commonest microscopic creatures are quite unlike anything else found elsewhere. Among our collections are live Adelle penguin, skins of four typical seals, Weddell crab-eater, Ross seal, and sea leopards; also skins of Emperor, Adelle, and ringed penguins. An interesting fact in connection with the rotifers at Cape Royds is that they produce living young unlike many species in warmer climates, which lay eggs. Fish abound at Cape Royds. I caught many thousands with traps, sunk down to the sea bottom. In the region of the hut the sea floor is from 25 to 100 fathoms, and is a forest of sponges."

Mr. G. E. Marsden, the artist of the expedition, has been sketching a sketch of a sketch.

eau discovered by his expedition. The plateau was irregular, which made it very hard travelling further from its altitude, as it was swept by severe blizzards.

PROFESSOR DAVID INTERVIEWED.

CHRISTCHURCH, Friday.

Professor David, interviewed at Wellington, gave further interesting details of the scientific results. In addition to the large orange brown fungus of the lakes, vegetation in the form of lichens and mosses was tolerably plentiful on the rock surfaces from which snow melted in summer-time. At Cape Royds, the rocks, being formed of black lava from Mount Erebus, are great absorbers of the sun's heat, and the Mount Erebus expedition noticed, at altitudes of 8000ft to 9000ft, and at temperatures below zero that snow at once commenced to thaw when placed on top of a piece of black rock exposed to sunlight. This no doubt explains how it is possible for such plant life to flourish at the Antarctic. A point of special interest regarding marine fauna near Cape Royds may provisionally be concluded. It bears some distinct resemblance to types of animal life of the coal measure series of Australia and Tasmania. Amongst the marine shells pecten were especially abundant, and formed the chief types preserved in raised beaches discovered by Mr. Priestly on the east coast of Victoria Land.

The northern party journeyed along the coast before turning inwards towards the magnetic pole. Masses of marine muds were found on top of high hummocks of ice, 30 feet or 40 feet above sea-level. These contained vast numbers of well preserved foraminiferal shells, the type biloculina being specially abundant. It is interesting to note that this form survives nearest the North Pole, forming the so-called biloculina ooze not far from the Arctic circle. The journeys south to 80 deg. 23 min., north to the magnetic pole, in 72 deg. 25 min., gave an opportunity of studying in a general way the geological structure of the Antarctic continent over a distance from north to south of fully 1100 miles. Only at intervals solid rocks from beneath the mantle of snow and the glacier ice were met with. It is clear from these explorations that the possibilities of Antarctica having been an archipelago can no longer be entertained. There is no doubt now that there is a high continental plateau, extending from the new mountains recently discovered by the Nimrod, 45 miles west of Cape North, to the magnetic pole, across the plateau traversed by Captain Scott, of the Discovery, and over a portion traversed by Shackleton in his farthest south journey, to beyond the South Pole itself, probably for a distance of 1800 miles.

By far the most interesting geological discovery was that made by Mr. Wild and Lieutenant Shackleton of coal measures in latitude 85 deg. south. The coal measures were at least 1500ft thick, and were formed mostly of fine grained sandstones, with occasional water-worn pebbles of white quartz. There were at least seven seams of outcrop in the cliff face of a great nunatak, where the discovery was made. They varied in thickness from 1ft to 7ft. Some seams were free from clay bands, others contained numerous bands of fire clay. Abundant small fossil root impressions were present in this clay. The coal contained a great quantity of so-called mineral charcoal, representing plant material, which still retained some of its original cellular structure. Although careful search was made for definite fossils, such as would decide the geological age of the coal measures, none was found. Nevertheless, it is probable careful microscopic examination of sections of the mineral charcoal may throw some light on the character of the plants which formed the coal. The presence of water-worn quartz pebbles alone in sandstones and the thickness of the sandstones themselves imply the action of running water prolonged throughout many ages. These evidences taken in conjunction with that of the abundant vegetation necessary to form

Ascent of Mt Erebus. 2

Brockhurst & Frost - bits
The Great Crater 115. miles
(13,000 feet.)

Glissade.
Brockhurst's toe.

4 months out at night
Busy (Photographing) X

Quant. & foam. X

Sledge party. mawson muddy
2 sledges. Riley work. 3

1 ton each. X

4 over the sea ice. J.W.S.D. in
mawson in crevasse. X

Xmas Day. magnetic pole. X

Blizzards - bleeding lips
hands & feet. X

monstaches. X

3. man sleeping bag

Vertical compass

Mawson's down a
crevasse & we got to the
South magnetic Pole.

Bread & butter & tea,

1200 miles. longest unsupported
-ed sledge journey in history of antarctic.

Antarctica. 1

Nimrod 227 lbs. 34 years old.
Oat & green lent. shacks. ↑ 4 ft.

Collision.

Cast off. meant to founder
Way down South. (35 men
10 ponies
6 dogs.

And lang syne.

Koonya 800 tons

Heavy gales 45°-50° roll.

Galley boy. Here we go
gathering nuts in May.

Steam pump.

Koonya goes.

Floating Venice.

Nip & run. Great Barrier.

Hut-building.

19 tons of coal.

Ponies 4 die. Geol. Zeal.

Morgy ration 1 lb. 5.

Socks & Whiskey. Killer whales.

Midnight Sun. (Turning
modest)

Pups & meat tin. X

Dogs & blizzard. X

Penguins. X

Mawson.

Shackleton's Great 3

Journey. 4 men

4. ponies.

Ice Barrier.

Pendulous glacier.

Frank Wild & Socks.

Quack.

Socks. 100 geog. miles

Dysentery.

Chinaman's blood-ice.

30 miles x 3 = 90 miles.

1700 miles. to rescue
marshall.

Cui bono. Is it worth it

£50.000 + a baronet's title

16 months of the lives of

35 men. Geography & Poles. X

Meteorology. (Macnair's 2d)

(a) Antarctic Storms Am

(b) Rainfall of Argentina

Ice in Weddell Sea

Magnetism 71° 10' S.

150° 45' E.

9 miles a year N. W.

Variation of compass

They hat go down to the
sea in ships

Economic minerals 4

Copper.

Antimony

Coal-field. Vereeniging

Same fossils as

Transvaal & Natal Coal-fields

100 miles x 50. miles

100.000 million tons. 1/8

= £33.000 million pounds.

£28.000 War debt.

£1000 mls. a. f. m. in m. m. m.

Annexed. Ant^a for Empire

Whaling. £50.000 + toe.

Worth in South Georgia

Ethical { Personal ambition

Glamour

Fighting spirit XX

Service to Empire. XX

Ross & Franklin.

Comradeship. Shackleton

These be the lines you grave for

Here he lies

5 are gone

Surely one is preserved for

Some good purpose,

Infinity. Simple faith

He prayeth well that loveth well

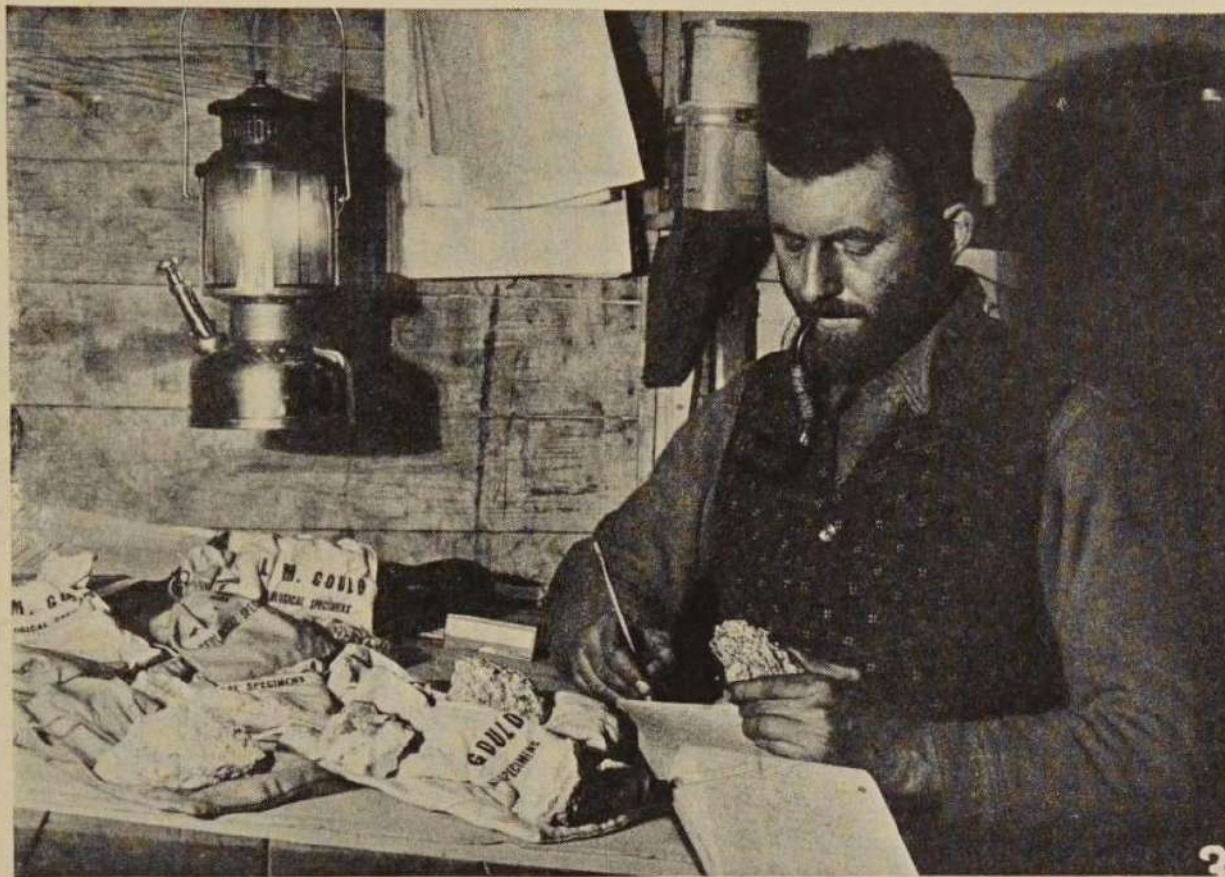
Both bird & man & beast.

He prayeth best that loveth best

All things both great & small.

For the great God who loveth us

He made & loveth all.



DR. LAURENCE M. GOULD, GEOLOGIST AND SECOND IN COMMAND.



THE GEOLOGICAL PARTY.

Left to right, seated:—George A. Thorne, Jr., Frederick E. Crockett, Dr. Laurence M. Gould, Norman Vaughan; *Standing:*—Edward E. Goodale and John S. O'Brien.



THE GEOLOGICAL PARTY AT AMUNDSEN'S CAIRN.

Dr. Gould is reading the note which Amundsen left there in 1912.

"All the News That's
Fit to Print."

The New York Times.

THE WEATHER

Rain and colder today; tomorrow
fair and colder.
Temperatures yesterday—Max. 57, min. 46.
U. S. Weather Forecast—For details see page 42.

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VOL. LXXIX...No. 26,277.

NEW YORK, FRIDAY, JANUARY 3, 1930.

TWO CENTS In Greater | THREE CENTS | FOUR CENTS Elsewhere
New York Within 100 Miles | Except 7th and 8th Postal Zones

BYRD GEOLOGIST DISCOVERS COAL STRIP ON MT. NANSEN INLAID IN SANDSTONE CAP

LOCATED 6,000 FEET HIGH

Gould Tells of Perilous
Climb to Reach 'Highly
Carbonaceous Layer.'

AWED BY CLIMAX OF WORK

He Declares Summit Formation
Is What He "Had Come All the
Way to Antarctica to Find."

LINKED TO OTHER TRACES

Prof. Taylor of Chicago Hails
Evidence Supporting Theory of
Vast Plateau Deposits.

By REAR ADMIRAL R. E. BYRD.
Commanding Byrd Antarctic
Expedition.

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out the world.

Wireless to THE NEW YORK TIMES.

LITTLE AMERICA, Antarctica,
Jan. 1.—We have a report from the
geological party so interesting that I
am going to send it northward just
as it came from Dr. Gould (Law-
rence M. Gould, leader of the party.)
I wonder if it is generally realized
that this little unit of our expedition
is as the crow flies further from us
than Boston is from Richmond? That

President Is in Fine Shape
After Shaking 6,300 Hands

Special to The New York Times.
WASHINGTON, Jan. 2.—Presi-
dent Hoover returned to his office
today in fine shape, after the try-
ing ordeal of yesterday, when he
shook hands with more than 6,300
persons at his first New Year's
Day reception at the White House.
One caller observed that the Presi-
dent's right hand was swollen, but
members of the White House staff
denied this.

The reception yesterday virtually
closed the Presidential handshak-
ing for some time. Mr. Hoover
will now return to his custom of
receiving delegations without this
ceremony, or of being photo-
graphed with them on the steps of
the State, War and Navy Building,
near his temporary offices.

WALKER TO DONATE PAY RISE TO CHARITY

Denounces Critics of Increase
as He Announces He Will Give
\$15,000 Yearly to Aid Needy.

LAUDS HARVEY FOR IDEA

Sees 'Immorality' Issue Ended
—Tells State Chamber of
City Sanitation Plans.

REPUBLICANS OPEN FIRE ON ROOSEVELT; ATTACK 3 BUREAUS

Bitter Onslaught in Both Houses
Follows the Governor's Spe-
cial Prison Message.

RIOTS CALLED AVOIDABLE

Bank Failures Laid to Adminis-
tration—Executive in Spirited
Reply Deplores "Politics."

PRISON FUNDS ARE ASKED

Governor, in Message, Terms the
System Antiquated and Seeks
\$1,000,000 for Emergency.

By W. A. WARN.

Special to The New York Times.
ALBANY, N. Y., Jan. 2.—Republi-
cans of the Senate and Assembly
brought up their heavy artillery to-
day and launched a concerted attack
on Governor Roosevelt's Administra-
tion. The attack came within twenty-
four hours after the Governor, in
his annual message, had invited the
friendly cooperation of the opposition
on the common task of promoting the
interests of the State through wise
and wholesome legislation.

The Legislature, contrary to the
precedent, had been held in session
today for the purpose of receiving a
special message from the Governor,
calling for appropriations of approxi-
mately \$1,000,000 to meet emergencies
at the State prisons brought on by
recent riots, as well as appropriations
for the salaries of additional exami-
ners in the State Department of
Banks.
The reading of this message gave
rise to bitter debate, which lasted for

Jennings Is Out as Auburn Prison Warden; Gives Injuries in Riot as Cause of Retiring

Special to The New York Times.

ALBANY, N. Y., Jan. 2.—Brig-
Gen. Edgar S. Jennings has given
up his post as warden of Auburn
prison.

Dr. R. P. Kieb, Commissioner of
Prisons, announced Mr. Jennings's
step as a resignation. When told
tonight that Mr. Jennings denied he
had resigned, the commissioner said:
"If he has not resigned, I can't
read: I have the letter in his writ-
ing, and it says that he wishes to
retire and take advantage of the re-
tirement benefits."

The prison riots occurred in the
last six months at Auburn under
Warden Jennings's regime and in
the second one last month he was
himself a victim. He was gassed by
rescuers and beaten by the rioting
prisoners who captured him. It was
on account of his injuries that he re-
signed, according to Dr. Kieb, who
refused to make public the letter.
"He felt that the experience
through which he had passed had so
undermined his health that it ap-
peared physically impossible for him
to continue," said the commissioner.
Governor Roosevelt also told in-
quirers that the withdrawal was due
to the physical incapacity of the for-
mer warden. Neither he nor Com-
missioner Kieb would discuss who
might be successor to Jennings. Dr.
Kieb pointed out that the position is
under classified civil service and
that no one is immediately available
for the post. The Civil Service Com-
mission will have to arrange for the
necessary examination.

"Dr. Frank L. Christian will con-
tinue to serve as acting warden,
completing his task of stabilizing
conditions at Auburn. There will be
no immediate change," the commis-
sioner said.
It is known to be Dr. Christian's
wish, however, to return to his regu-
lar position as head of the Elmira
State Reformatory. He has no de-
sire to become permanent warden
at Auburn.
The Jennings administration has
been under heavy fire ever since the
second riot at Auburn. Whether any
official suggestion was made to him
that he should retire has not been
disclosed here.
Although he did not condemn the
Warden, Colonel George F. Chandler,
former superintendent of the State
police, who made a survey of the
prison for the Governor after the
second outbreak, charged that there
had been in effect a reign of terror
at Auburn. Colonel Chandler de-
tected that an unwarranted amount
of authority, grossly abused, had
been given to the Mutual Welfare
League, a self-governing organization
of prisoners who had exercised dis-
cipline over inmates and even given
orders to guards.

Special to The New York Times.

AUBURN, Jan. 2.—Notwithstand-
ing press dispatches from Albany
that Warden Jennings has resigned
as head of the State prison here, he
issued this statement:

"I have not resigned as Warden
of Auburn prison. I have written a
letter to the State Superintendent of
Correction, Dr. Raymond F. C.
Kieb, asking to be relieved from duty
as Warden under the provisions of
the State pension retirement system.
That is all I have to say for the
present."

BOSTONIANS TEAR UP COAST GUARD BILLS

Crowd Trample on Recruiting
Posters After Protest Meeting
Is Held in Faneuil Hall.

SPEAKERS ASSAIL KILLINGS

Resolution Calls on Hoover for
an Impartial Investigation

FESS URGES BORAH HEAD DRY INQUIRY

Ohioan Calls President's Critic
Ideal Choice for Joint Com-
mittee of Congress.

PROSECUTORS CHECKED UP

Mitchell Scans Dry Records of
All—New Alcohol Permit Is

10 ON MOVIE PLANES KILLED IN CRASH OVER THE PACIFIC

Stunt Fliers for Fox Films Fall
3,000 Feet in Flaming Craft
Off Redondo Beach, Cal.

SMASH HEAD-ON ALOFT

Pilot of Third Plane, With a
Parachute Jumper, Tells of
Seeing All Flung Into Water.

KENNETH HAWKS A VICTIM

Husband of Mary Astor, the Screen
Star, Was Director—Body of His
Aide, Max Gold, Recovered.

Special to The New York Times.

LOS ANGELES, Cal., Jan. 2.—Two
cabin airplanes, filled with motion
picture directors and technicians of
the Fox Films Corporation filming a
play, crashed head-on over the Pacific
this afternoon, burst into flames
and fell 3,000 feet into the ocean.

All those aboard, ten persons in all,
were killed. Among the dead were
Kenneth Hawks and Max Gold.
Kenneth Hawks was a well-known
director and sportsman, the husband
of Mary Astor, the actress, and
brother-in-law of Bessie Love. Mr.
Gold, the assistant director, formerly
was national handball champion.

A third plane, also engaged in the
making of the picture and carrying
Warner Baxter, the featured player,
and a double for Baxter, escaped
damage. Its pilot, Captain Horace
Turner, a close friend of Hawks,
watched the disaster, unable to pre-
vent it, then raced back to shore to
summon rescuers.

The Dead.

The dead were as follows:

WHALEN DEMOTES FLOOD AS BUNGLING IS REVEALED IN THE ROTHSTEIN INQUIRY

Mercury 20 Above Normal;
Cold and Rain Expected Today

Unbuttoned overcoats came into
temporary fashion yesterday as the
thermometer maintained an av-
erage of 52, twenty degrees above
the normal for Jan. 2. Fanned by
a moderate southwest breeze, the
mercury rose from 46 at 12:01
A. M. to a high of 57 at 3 P. M.
While unusual, the warmth was
not a record for the date, the gov-
ernment records disclosed. Colder
weather with rain is predicted for
today.

THEATRE MEN AGREE ON NEW TICKET PLAN

It Provides That Producers Re-
tain Ownership of Seats Con-
signed to Brokers.

75-CENT PREMIUM IS LIMIT

Representatives of 25 Houses
Pledged to End 'Buy'—Other
Managers to Be Canvassed.

Producers and managers represent-
ing twenty-five theatres met at the
office of Gilbert Miller in the Empire
Theatre yesterday and agreed upon a
method of distributing tickets which,
they were confident, would do away
with "the unconscionable prices de-
manded by brokers" and bring back

DETECTIVE SHIFTS BLAME

Asserts Coughlin Told
Him to Omit McManus
From 'Wanted' List.

CRITICIZES CAREY'S ACTS

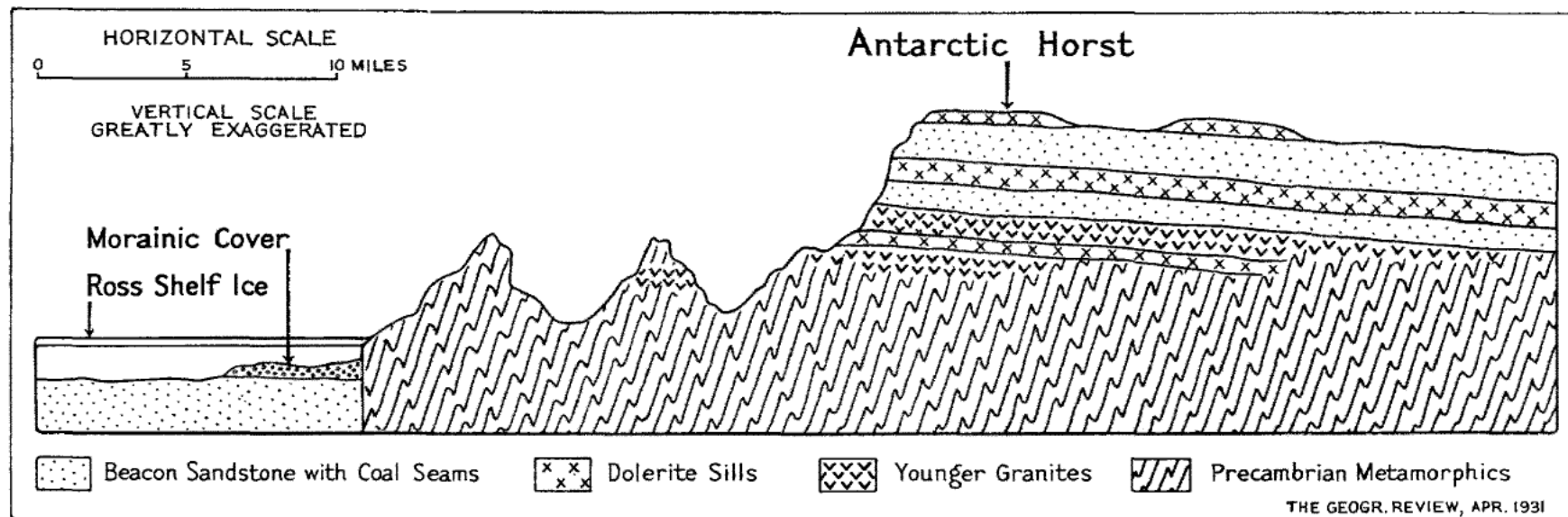
Ex-Inspector Responsible for
Failure to Fingerprint the
Gambler, He Testifies.

FLOOD CALLED "IGNORANT"

Story Shows for First Time
That Rothstein Phoned Some-
one After Summons to Hotel.

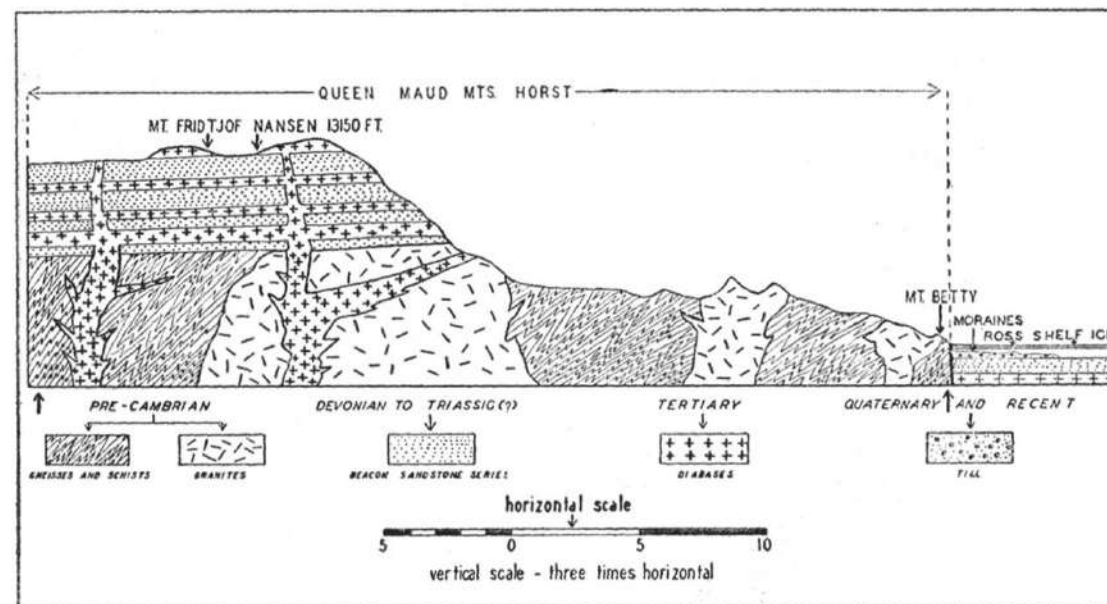
With a gesture that set the seal of
his disapproval on at least one sample
of the police work in the investiga-
tion of the murder of Arnold Roth-
stein, still unsolved fourteen months
after the crime, Police Commissioner
Whalen demoted a first grade detec-
tive to patrolman late yesterday
afternoon. The target of the commis-
sioner's dissatisfaction was Patrick
Flood, the first detective on the murder
scene.

The demoted man had gone on trial
at 11:45 A. M. and had undergone
nearly five hours of extremely search-
ing cross-examination when, as he
adjourned the case until this morn-



1931

FIG. 13—Generalized cross section of the Queen Maud Mountains.



1935

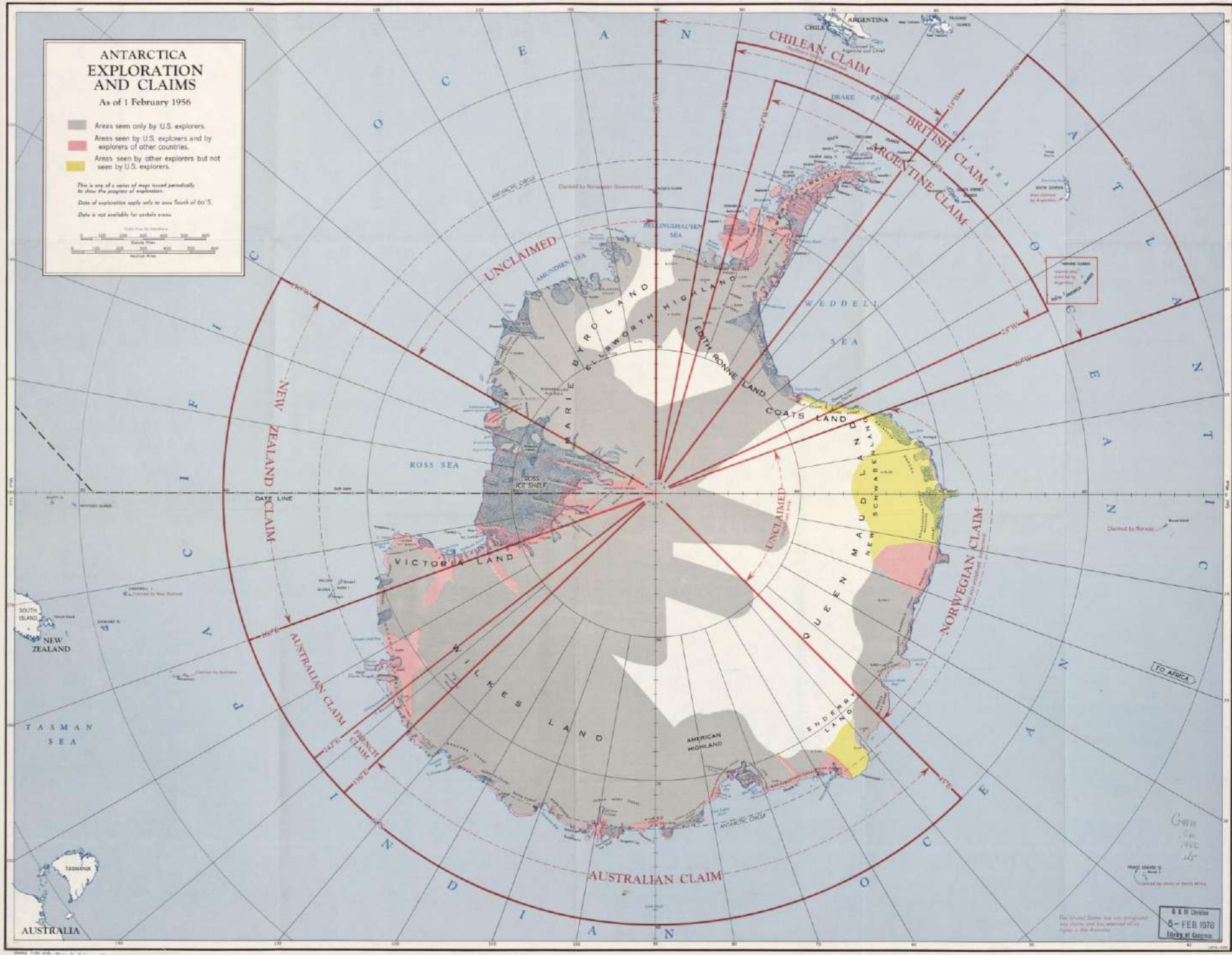
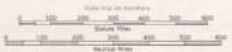
FIGURE 2.—Structure section across Queen Maud Mountains

ANTARCTICA EXPLORATION AND CLAIMS

As of 1 February 1956

- Areas seen only by U.S. explorers.
- Areas seen by U.S. explorers and by explorers of other countries.
- Areas seen by other explorers but not seen by U.S. explorers.

This is one of a series of maps issued periodically to show the progress of exploration.
 Date of exploration apply only to areas South of 60° S.
 Data is not available for certain areas.



64-11-00000
 4 FEB 1956
 Library of Congress

AT THE SOUTH POLE DURING THE IGY

THE INTERNATIONAL GEOPHYSICAL YEAR (IGY) STARTED JULY, 1957, AND LASTS THROUGH DECEMBER, 1958. SIXTY-FOUR NATIONS ARE PARTICIPATING IN STUDIES TO ENLARGE MAN'S KNOWLEDGE OF THE EARTH.

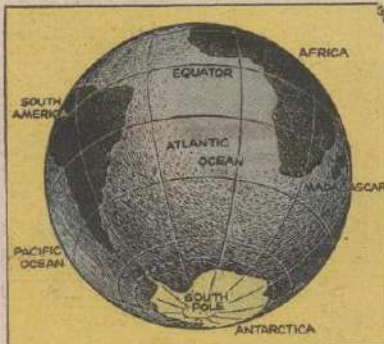


TEN NATIONS

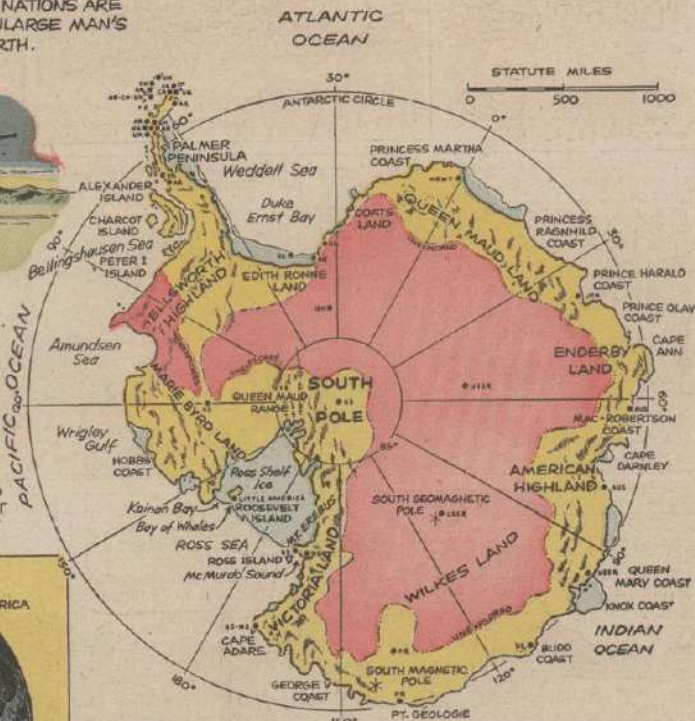
WILL MAN STATIONS IN ANTARCTICA DURING THE GEOPHYSICAL YEAR. HERE ARE THEIR PROPOSED LOCATIONS.

AR-ARGENTINA
AUS-AUSTRALIA
CH-CHILE
FR-FRANCE
JPN-JAPAN
NZ-NEW ZEALAND
NRW-NORWAY
UK-UNITED KINGDOM
US-UNITED STATES
USSR-RUSSIA

THIS SOUTH-POLAR CONTINENT IS AN ICE-CLOAKED MASS OF OVER 5,050,000 SQUARE MILES. IT AVERAGES 6,000 FEET ABOVE SEA LEVEL AND IS THE HIGHEST CONTINENT ON EARTH.

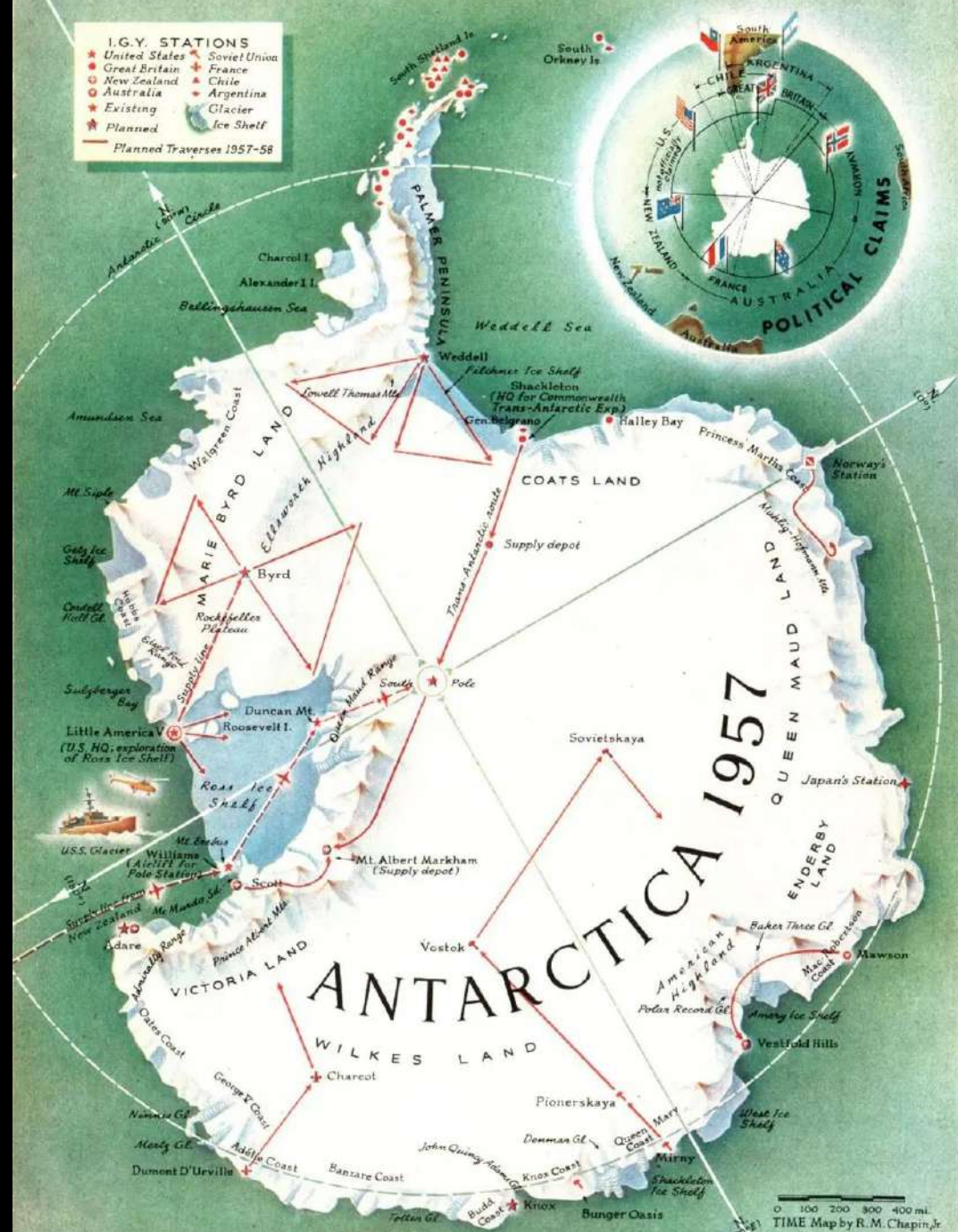


OPERATION "DEEP FREEZE" WILL MAKE MANY TESTS AND OBSERVATIONS ON ANTARCTICA DURING IGY. AMONG THEM...



ALTHOUGH TEMPERATURES AT THE SOUTH POLE MAY FALL TO 120° BELOW ZERO, HOT PLUMES OF STEAM RISE FROM AN ACTIVE VOLCANO. THE 15,200-FOOT MOUNT EREBUS ON ROSS ISLAND.

IGY STATIONS
United States
Great Britain
New Zealand
Australia
Existing
Planned
Soviet Union
France
Chile
Argentina
Glacier
Ice Shelf
Planned Traverses 1957-58



0 100 200 300 400 mi.
TIME Map by R.M. Chapin, Jr.



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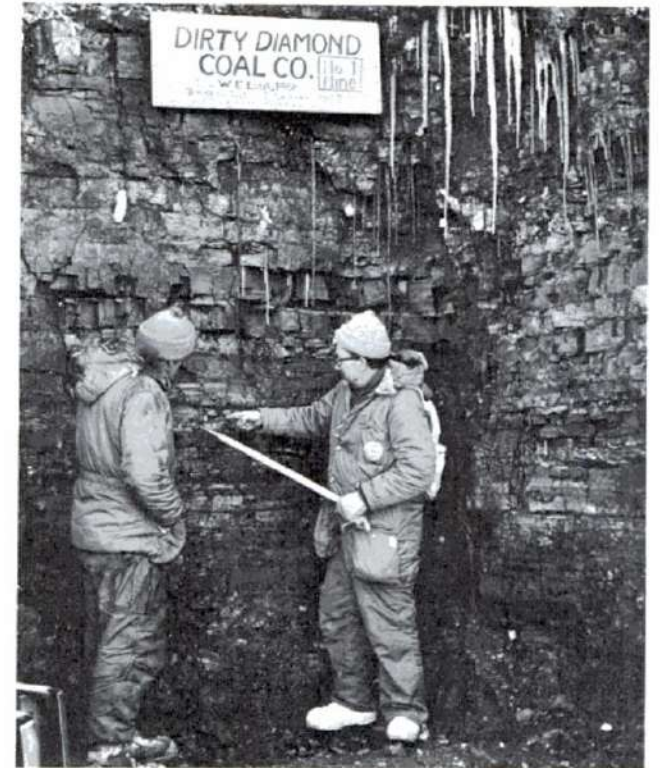
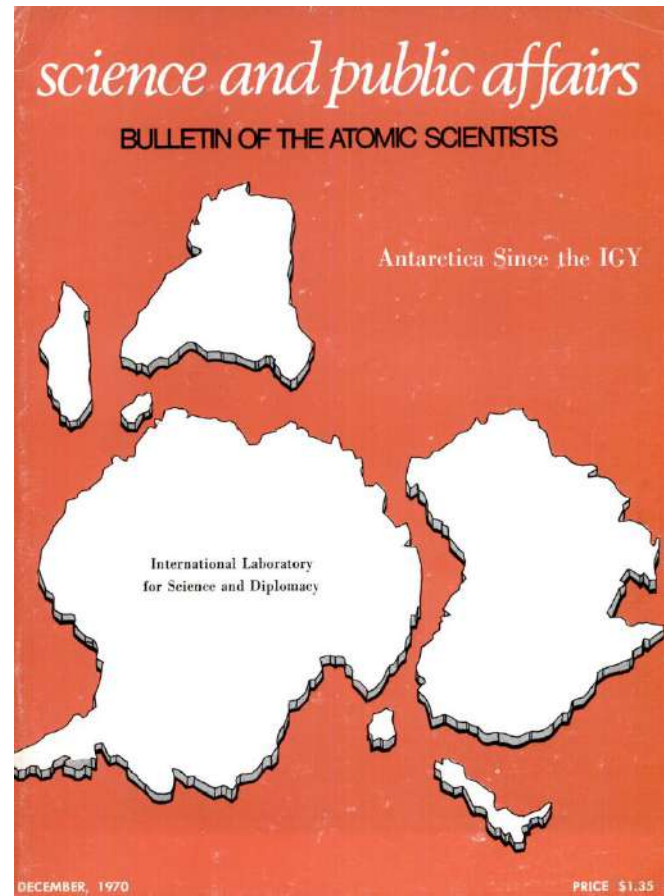
VOL. 16 BOOK 1-17

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Gealy



PRR-11785



Geologists examine wall of "coal mine" excavated in the mountains of the continental interior.

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West Antarctic ice sheet and CO₂ greenhouse effect: a threat of disaster

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Institute of Polar Studies, The Ohio State University, Columbus, Ohio 43210

If the global consumption of fossil fuels continues to grow at its present rate, atmospheric CO₂ content will double in about 50 years. Climatic models suggest that the resultant greenhouse-warming effect will be greatly magnified in high latitudes. The computed temperature rise at lat 80° S could start rapid deglaciation of West Antarctica, leading to a 5 m rise in sea level.

ATMOSPHERIC carbon dioxide traps some of the long-wave radiation emitted by the Earth's surface (principally near 15 µm wavelength), thereby tending to warm the troposphere. This so-called greenhouse effect has long been suspected^{1,2} but only recently, as the implications of a continuation of the current near-exponential growth of industrial CO₂ production have been realised, have many come to fear a disastrous climatic warming in the rather near future. In a recent report on the climatic effects of energy production, Revelle *et al.*³ conclude that industrial civilisation may soon have to decide whether or not to make the tremendous investment of capital and effort needed to change over from fossil fuels to other sources of energy. Bolin⁴, in hearings before the U.S. House of Representatives, points out that if all reserves of fossil fuel that are accessible by present techniques were burnt, thereby increasing atmospheric CO₂ content between five- and eightfold above its preindustrial level, the result would almost certainly be climatic disaster.

I contend that a major disaster—a rapid 5 m rise in sea level, caused by deglaciation of West Antarctica—may be imminent or in progress after atmospheric CO₂ content has only doubled. This concentration of CO₂ will be reached within about 50 years if fossil fuel continues to be consumed at its recent accelerating rate, or within about 200 years if consumption is held constant at today's level^{5,6}. Keeling and Bacastow⁶ believe that even if a policy of conversion to other sources of energy was started today and vigorously pursued, the global rate of consumption of fossil fuels would still double by the end of this century.

If so, the actual doubling time for atmospheric CO₂ content is likely to be nearer 50 than 200 years.

Many attempts have been made to estimate by climatic modelling the average global rise in temperature that would result from a doubling of atmospheric CO₂ content. The figures obtained have ranged from 0.7 K to 9.6 K, and Schneider⁷ has critically examined the models in an attempt to clear up the confusion created by these widely different estimates. He points out that some of the models give unrealistic results because they compute an equilibrium condition for the Earth's surface rather than for the Earth-atmosphere system as a whole. He stresses the advantages of radiative-convective models, which take into account vertical motions of the atmosphere and latent heat transport, and he compares the radiative-convective models of Rasool and Schneider⁸, who had computed an average global temperature rise of 0.8 K, with that of Manabe and Wetherald⁹ who had computed a rise of 2.3 K, later revising this to 2.9 K. He estimates that, using the most refined input of feedback mechanisms that is possible with present knowledge, globally-averaged temperatures would rise about 1.9 K. But, because some feedback mechanisms may have been improperly modelled, some (especially those involving changes in cloud cover and cloud top elevation) have been largely ignored because of our inability to do otherwise, and others perhaps remain unknown, he concludes that the best state of the art, order of magnitude estimate is that a doubling of atmospheric CO₂ content would raise average global temperature by 1.5–3 K. He believes that this estimate is as likely to be too low as too high.

More recently Augustsson and Ramanathan¹⁰, using a different modelling technique, and taking into account the previously ignored effect of bands of weak absorption by CO₂, have calculated that global temperatures would rise about 2 K. This, they note, is similar to Schneider's figure; they find this encouraging, but surprising and perhaps fortuitous because substantially different modelling techniques were used. Their one-dimensional model gives no information about differences between latitudinal zones, but the three-dimensional model of



Fig. 3 *a*, Antarctic ice cover today, and *b*, after a 5–10 °C warming.

SCIENTIFIC COMMUNICATIONS

COAL IN ANTARCTICA

JOHN F. SPLETTSTOESSER

Minnesota Geological Survey, University of Minnesota, 1633 Eustis Street, St. Paul, Minnesota 55108

Introduction

Coal is one of few mineral resources that possibly could be exploited economically in Antarctica be-

cause of the apparent size of individual deposits near the margins of the continent. Coal deposits in Antarctica contrast with other mineral deposits by being

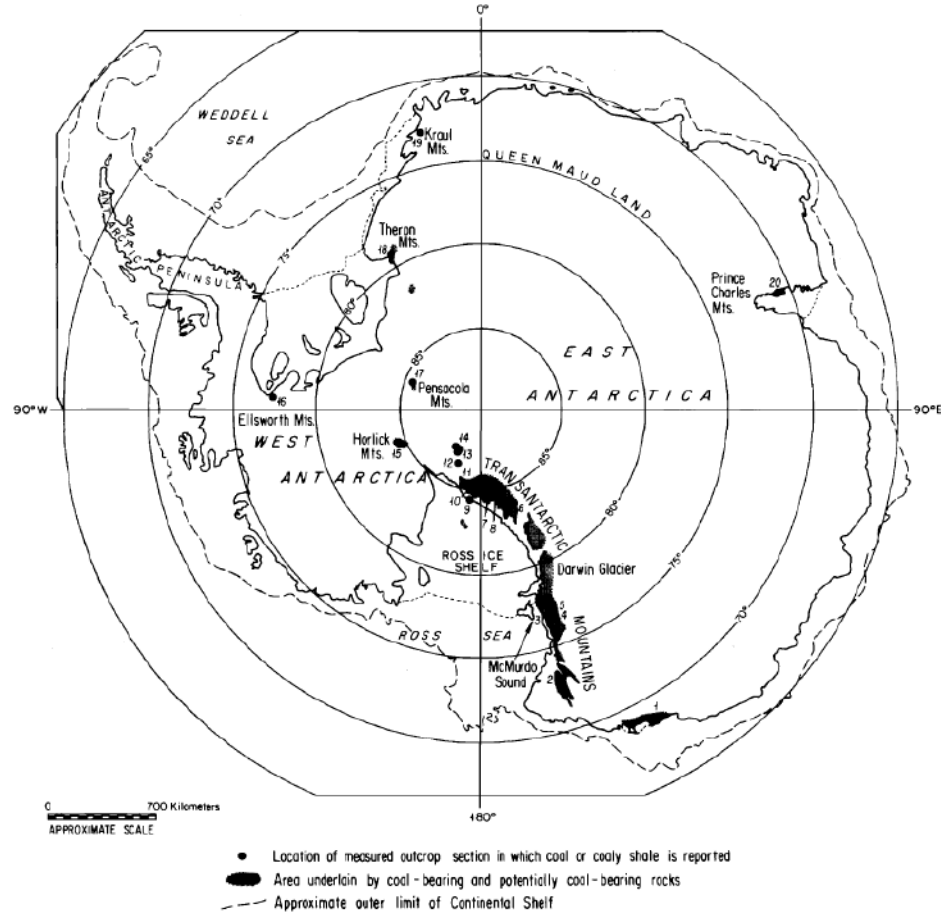


FIG. 1. Distribution of coal occurrences in Antarctica (modified from Wright and Williams, 1974).

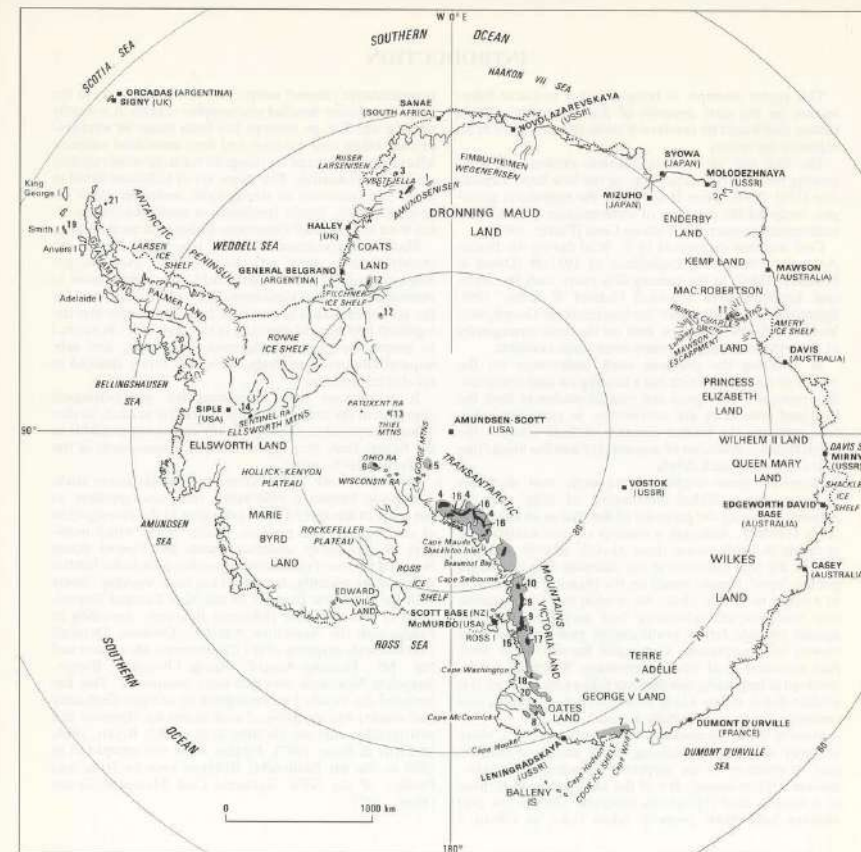


Resource Report

2

Coal potential of Antarctica

G. Rose & C.T. McElroy



• Manned station

Beacon supergroup
After "Geological Map of
Antarctica" C. Craddock 1972

Fig. 1. Map showing location of coal measures in Antarctica. The Territorial Claims have been redrawn from the ANTARCTICA map (polar stereographic projection, 1:20 000 000, 3rd. edition, 1979), Division of National Mapping, Canberra. "The indication of boundaries on this map and the description of the areas within them are intended to agree with the national legislation of the countries concerned but are not to be treated as evidence of the official views of the Government of Australia with respect to the national legislation of other countries".

2

1 Areas where coal measure sediments have been identified (partly diagrammatic)

TERTIARY COAL MEASURES (Table II)

21 Cross Valley Formation

JURASSIC COAL MEASURES (Table II)

20 Ferrar Basalt (Interbeds of coal)

7 JURASSIC/TRIASSIC COAL MEASURES (Table II)

19 Unnamed - Smith Island

TRIASSIC COAL MEASURES (Table II)

18 "Timber Peak Beds"

17 Allan Nunatak Formation

16 Dominion Coal Measures, Fella Formation, Fremouw Formation

15 Lashly Formation

PERMIAN COAL MEASURES (Table I)

14 Polarstar Formation

13 Pecora Formation

12 Theron Formation

11 Bainmedart Coal Measures

10 Mithound Coal Measures

9 Weller Coal Measures

8 Takrouna Formation

7 Unnamed - Horn Bluff

6 Mt Glossopieris Formation

5 Queen Maud Formation, Weaver Formation

4 Buckley Formation

3 Unnamed - Vestfjella (Kraul Mtns)

2 Unnamed - Heimefrontfjella

1 Amelang Formation

TERRITORIAL CLAIMS



Australian Antarctic Territory
Ross Dependency (New Zealand)
Adelie Land (France)
Dronning Maud Land (Norway)
British Antarctic Territory
Argentine Antarctic
Chilean Antarctic

Mineral Resources Potential of Antarctica

John F. Splettstoesser
Gisela A. M. Dreschhoff
Editors

 American Geophysical Union
Washington, D.C.
1990

COAL GEOLOGY, COAL QUALITY, AND COAL RESOURCES IN PERMIAN ROCKS OF THE BEACON SUPERGROUP, TRANSANTARCTIC MOUNTAINS, ANTARCTICA

D. A. COATES, G. D. STRICKER, AND E. R. LANDIS

U.S. Geological Survey, Branch of Coal Geology, Federal Center, Denver, Colorado 80225

Permian coal beds occur within a fluvial sedimentary sequence in the Victoria Group of the Beacon Supergroup from the Ohio Range to northern Victoria Land, a 2000-km-long belt in the Transantarctic Mountains, Antarctica. Although coal beds as thick as 10.7 m have been reported, most beds are thinner than 2 m. Coal beds are generally lenticular, and exposure along strike is commonly not more than 1-3 km. In northern Victoria Land the Takrouna Formation contains coal in the small North Victoria Basin; in southern Victoria Land the larger South Victoria Basin contains the Weller Coal Measures; and the southernmost and largest basin, Nimrod-Ohio Basin, from the Nimrod Glacier to the Ohio Range, contains the Buckley Formation and its equivalents. One hundred forty-four published analyses of Permian coal from this region show that ash contents range from 3.2 to almost 50% with an arithmetic mean of 15.3%, and sulfur ranges from 0.0 to 4.8% with an arithmetic mean of 0.57%. Apparent rank of the coals ranges from high-volatile C bituminous coal to anthracite, but most of the coal samples have apparent ranks of low-volatile bituminous coal and semianthracite. The relatively high rank of much of the coal of the Transantarctic Mountains probably is related both to heat and pressure from sediment load and to heat from igneous intrusion; the dominant mechanism, however, remains to be determined. Paucity of data on coal thickness and distribution dictates that coal resource estimates be assigned to the hypothetical classification. Calculations based on published geologic maps, geologic descriptions, and measured sections indicate hypothetical resources of 3 billion metric tons in the North Victoria Basin, 50 billion metric tons in the South Victoria Basin, and 100 billion metric tons in the Nimrod-Ohio Basin.

INTRODUCTION

Much has been written over the past three decades about the presence of coal in Antarctica. Included has been speculation about the quantity and quality of the coal and whether this coal might legitimately be considered in the assessment of world energy resources. Coal occurs in widely spread locations on the Antarctic continent (Figure 1) and ranges in age from Permian to Tertiary. Although published reports from scattered localities describe coal beds as thick as 10.7 m, few reports have attempted to summarize available information and synthesize a coherent picture of what is known about the coal resources of Antarctica.

Wright and Williams [1974] show the areas of known coal-bearing rocks in Antarctica. Splettstoesser [1980] summarizes the stratigraphy of the coal-bearing Permian rocks in the Transantarctic Mountains and discusses in a general way the possibilities for utilization of Antarctic coal. Kamenewa and Mikhal'skiy [1985] summarize the range of analyses of Permian coals from the Transantarctic Mountains and the Prince Charles Mountains. Their estimate of coal resources in limited areas

includes 6 billion metric tons in the Queen Alexandra Range in the central Transantarctic Mountains and 130 million metric tons in southern Victoria Land. No limit on depth of coal is specified.

The most complete discussion of coal in Antarctica of which we are aware is Rose and McElroy's [1987] paper "Coal Potential of Antarctica." Those authors show the localities of all major and most minor coal occurrences in Antarctica including Permian, Triassic, Jurassic (?), Cretaceous, and Tertiary coals. They summarize in tabular form the most important articles about each major area and present and discuss representative coal analyses from each area where analyses are available. Particularly useful is their bibliography of nearly a hundred references covering coal in all parts of the continent.

Rose and McElroy [1987] and Whitby et al. [1983] discuss some of the difficulties and limiting factors that face any attempt to exploit coal in Antarctica. Included are a unique ecosystem, long distances to markets, and the logistic and human problems involved in maintaining a small remote settlement, as well as the technological problems of working in a cold dry climate. Problems analogous in some ways have been faced in Spitzbergen,

Using Cape Town as a launchpad, Russia boasts of supergiant oil fields in Antarctic wilderness

As Antarctic Treaty nations release the Paris Declaration, a new climate manifesto, Daily Maverick can reveal this international investigation: Russia has combed the fragile Southern Ocean for oil and gas on a staggering scale after Antarctica's mining ban formally entered into force more than two decades ago.



By Tiara Walters

25 Oct 2021



Illustrative image | Sources: Tiara Walters, Wikimedia | Isadora Romero / Bloomberg / Getty Images | Gallo Images / Die Burger / Jaco Marais / Flickr



Antarctic mineral resources: Looking to the future of the Environmental Protocol

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ARTICLE INFO

Keywords:
Antarctic
Environmental Protocol
Mineral resources
Drilling technology

ABSTRACT

On-going trade wars combined with the increasing consumption and depletion of known resources will necessitate the search for new deposits in poorly explored or unexplored areas, such as the polar regions. Antarctica is particular among the world's continents in that it has no native population and state sovereignty; the continent has also been identified as potentially harboring extensive hydrocarbon and mineral resources. In order to protect the fragile environment of Antarctica, the Protocol on Environmental Protection to the Antarctic Treaty (1991) banned all mineral activities for a 50-year period, except for scientific purposes. The Protocol will be reviewed in 2040, and discussion of possible future mining in the region has already begun. With the improvement of drilling and mining technology, the risk of future mining activity on the continent is increasing. Moreover, extensive mining operations in the Arctic demonstrate the technical and economic feasibility of mining activities in harsh polar environments. The conservation of the fragile environment of Antarctica must be prioritized and some considerations of renewal of the Protocol on Environmental Protection are discussed in this paper.

1. Introduction

The recent trade wars between the US and China and the EU and Russia, as well as the Saudi-Russia oil price war, the US shale industry crisis, and the recent pandemic lockdowns have caused significant stock market turbulence and negative economic impacts in many countries (Zhang and Talalay, 2021). To protect the economy, many developed and industrial countries are focusing on energy and mineral independence. Oil and mineral resources are disproportionately distributed across the world, with some countries having significantly higher resources than others. Based on data from Organization of Petroleum Exporting Countries (OPEC) in 2019, Venezuela, Saudi Arabia, Iran, Iraq, and Kuwait hold two-thirds of the global proved oil reserves (OPEC, 2020). China, accounts for >90% of global rare-earth supply, recently prioritized its own economic demands and began to limit exports (Richard, 2013). South Africa has just two mines that supply >80% of the global platinum, which is key to catalytic converters and new fuel cell technology. Additionally, >30% of the total copper supplies—a widely used metal—is produced in Chile. In 2010, China suspended exports of rare earth elements to Japan for nearly two months, a clear illustration of the political risks posed by the geographically

disproportionate spread of key raw materials. Thus, to continue the rate at which we use mineral resources, the global race for oil and critical minerals will require the discovery of new deposits in poorly explored or unexplored areas, such as the polar regions.

The issue of mineral exploitation in Antarctica was first addressed in the 1972 Antarctic Treaty Consultative Meeting in Wellington, New Zealand, which was the initial discussion of non-living resources (SCAR, 1972). Attendees agreed on the feasibility of potential mineral development in Antarctica, and thus, laws were required to regulate future exploitation. The first mining regulations in Antarctica were developed by the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA) adopted at the 12th session of the 4th Special Antarctic Treaty Consultative Meetings (ATCM), held also in Wellington in 1988 (SCAR, 1988). The Convention was opened for signature on November 25, 1988; however, governments of Australia and France officially refused to ratify the document and this prevented its entry into force.

The Protocol on Environmental Protection to the Antarctic Treaty (referred to as the Madrid Protocol, 1991) was developed in 1991 and regulates any future oil and mineral resource activity in the region (SCAR, 1991). Article 7 of the Madrid Protocol forbids all actions

nature climate change

Article

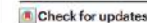
<https://doi.org/10.1038/s41558-026-02569-1>

Emergence of Antarctic mineral resources in a warming world

Received: 23 June 2025

Accepted: 16 January 2026

Published online: 20 February 2026



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The extent of ice-free land across Antarctica will increase in a warming world, driven by ice sheet retreat and sea-level change. Here we project an up to ~120,000 km² (~550%) increase in the extent of Antarctic ice-free land over the next three centuries, using a state-of-the-art sea level model combined with ice sheet melt predictions for a range of greenhouse gas emission scenarios. New ice-free land is projected to emerge in all regions with existing territorial claims as well as in the unclaimed sector in West Antarctica. The geologic setting and distribution of known mineral occurrences indicate that ice-free land emergence will expose new mineral deposits in these regions. With the likely rise in the economic viability of Antarctic mineral resources over the coming centuries, the environmental impacts of mineral resource extraction activities will be weighed against societal pressure for sustainable resource development.

The Antarctic Treaty was signed in 1959 by three categories of states: those with territorial claims in Antarctica (that is, Argentina, Australia, Chile, France, New Zealand, Norway and the United Kingdom; Fig. 1), non-claimant states (that is, Belgium, Japan and South Africa) and the USA and the Soviet Union (now Russia). Although seven states maintain territorial claims in Antarctica, many other countries do not recognize these claims^{1–3}. Additionally, both the USA and Russia still maintain a basis to claim territory in Antarctica⁴. Article IV of the Antarctic Treaty asserts that nothing in the treaty renounces a state's previously asserted rights or territorial claims in Antarctica or prejudices a state's "recognition or non-recognition of any other State's right of or claim to territorial sovereignty in Antarctica"⁵. Only one sector of Antarctica remains unclaimed (Fig. 1). Furthermore, the Antarctic Treaty establishes Antarctica as a region reserved exclusively for scientific research and peaceful purposes⁶.

At present, less than 0.6% (21,745–70,586 km²) of Antarctica is estimated to be free of ice cover^{7,8}, with ice-free areas including coastal environments, mountain ranges, nunataks, valleys, islands and cliffs

(Fig. 1). The Antarctic ice sheet has undergone rapid thinning and grounding line retreat over the past few decades^{9,10}, and ice sheet retreat is expected to continue over the coming centuries¹¹. This anthropogenically driven process will lead to the emergence of ice-free land (henceforth "land") due to both the direct effect of ice margin retreat and the Earth system response to changes in ice loading—that is, glacial isostatic adjustment (GIA). Regarding the latter, at the margin of a rapidly melting ice sheet, sea level will fall due to the combined impact of post-glacial uplift and the loss of gravitational attraction between the ice and the surrounding oceans¹².

Land emergence in Antarctica over the coming centuries will have wide-ranging environmental impacts and implications for mineral resource development prospects, both of which will play key roles in shaping Antarctic geopolitics. Antarctica's terrestrial biodiversity is largely concentrated in ice-free areas^{13,14}, and these regions are also particularly important for geologic, fossil and soil sampling^{15,16}. Furthermore, scientific research stations and associated infrastructure—including wharfs, roads and airfields¹⁷—are commonly built on

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