

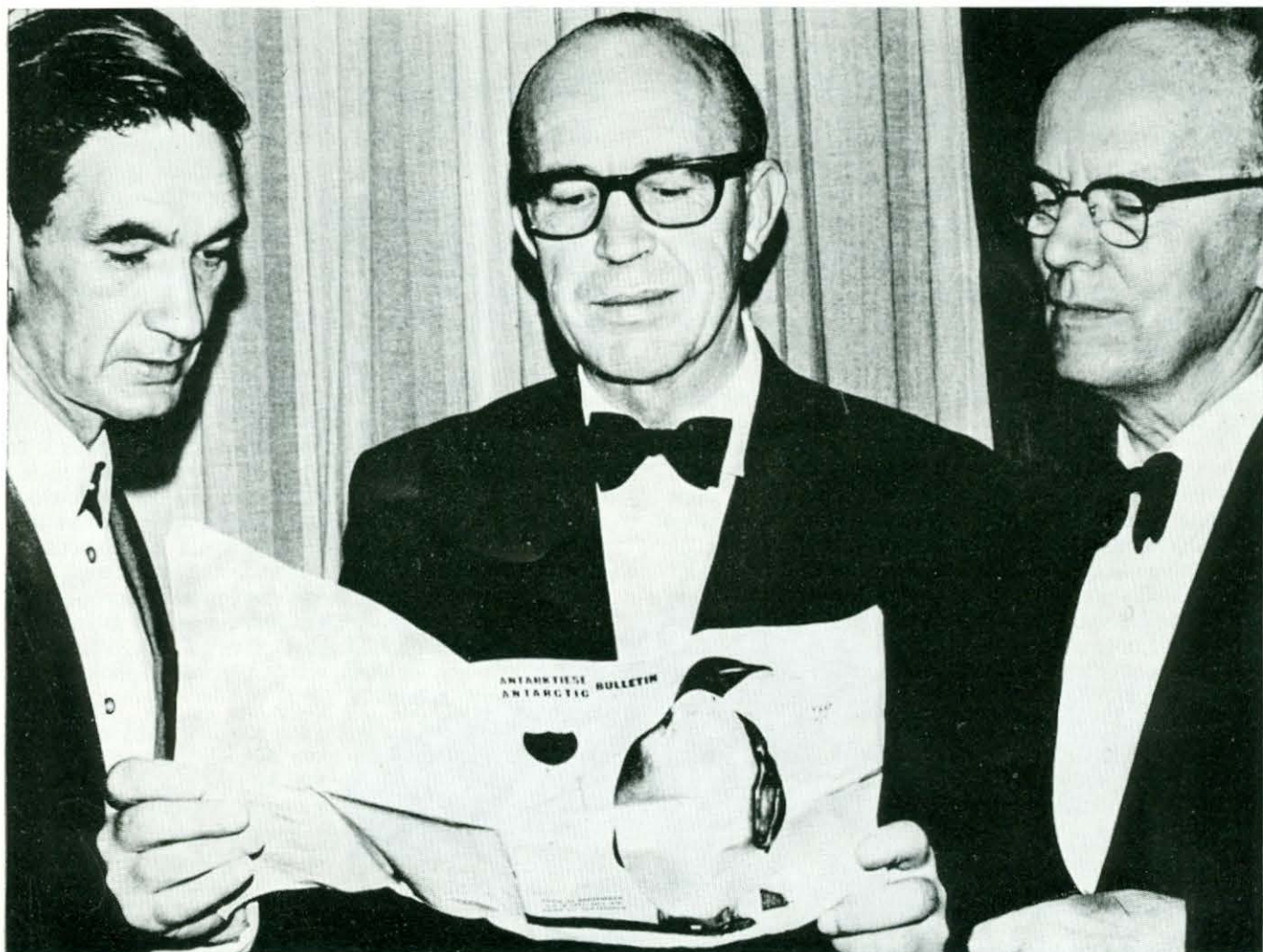
# MARION AND PRINCE EDWARD ISLANDS

(An address delivered by Prof. E. M. van Zinderen Bakker to the South African Antarctic Association on the occasion of the Annual Dinner held on 18th March, 1972)

I am very pleased indeed, Mr. President, to have been invited to speak on this special occasion. In accepting the invitation I should, however, have warned you that I do not belong to the true Antarctic branch of people. I am a member of the "sub-Antarctic gang", the people who are interested in those small islands which are scornfully called the banana islands by your people who live underground or should I say "under-ice" in deep freeze. I hope to explain to you that this matter of jealousy has no scientific foundation and that our problems and the scientific mysteries of the Antarctic are so closely related that they cannot be separated.

From the scientific and especially the biological point of view the geographical position of the Republic of South Africa is very favourable. It is very gratifying that during the last 20 years the full opportunity of this position has been grasped and that South Africa is one of the active members of S.C.A.R.

The scientific problems which face us in the south are of an imposing nature and hold the answers to such questions as the origin of our land masses and the present-day patterns of ocean currents in the Southern Hemisphere, the earth's climate, the migration and



*Mr. Henry Fulton (left), recipient of the 1971 Antarctic Gold Medal, Mr. D. G. Kingwill, chairman of the S.A. Antarctic Association and Prof. E. M. van Zinderen Bakker, guest speaker on the occasion of the Annual Dinner of the Association. Professor Van Zinderen Bakker was leader of the 1965/1966 expedition to the sub-Antarctic Islands and a co-editor of the comprehensive work Marion and Prince Edward Islands.*

(Photo: Pretoria News)





*Marioneiland:*

*Die basis met Junior Kop  
in die agtergrond.*

(Foto: E. M. van Zinderen Bakker)

evolution of biotas; in short, to many basic physical and biological quests of science. This is the reason why so many nations encourage their scientists to search for the secrets which are hidden under enormous sheets of ice and at the bottom of immense oceans in the south.

Our tiny islands are very essential for the solution of some of these problems. They originated more than a quarter of a million years ago on the edge of the mid-oceanic ridge which marks in all the oceans the slow and continuous process of the separation of the continents of the world. Two South Africans have achieved fame by their studies of palaeontological evidence for the remote geological link which existed between the white sixth continent and Africa. Dr. Edna Plumstead, from the Bernard Price Institute for Palaeontological Research in Johannesburg studied the fossil *Glossopteris* flora of Antarctica and recently Mr. James Kitching of the same Institute first discovered *Lystrorhynchus murrayi*. During the 1970-71 season he also played an important part in the exciting discovery of several specimens of *Thrinaxodon* and *Procolophon*. The first two of these reptiles are highly specialized and mammal-like. These fossils form the first definite evidence for a former substantial land connection between Antarctica and Africa as these land animals are well known from the lower Triassic beds of South Africa.

As the continents of Gondwanaland drifted apart, small volcanic mounds and islands such as Marion and Prince Edward originated along the rift. The process of the building up of an oceanic island could recently be studied in great detail by an international expedition of SCAR countries which investigated the series of eruptions on the south Polar island Deception in 1967, 1969 and 1970. The volcanic and tectonic activities which form part of the history of these islands are an extremely interesting field of study for the geologist. He is also interested in the influence of the surrounding ocean on the islands and in the glaciations which affected them. The high sea levels of the warmer interglacials left fossil beaches behind which are situated well above the

present strandline, while glaciers marked the landforms by shaping "roches montonnées", polishing striated platforms and pushing up moraines.

Through these geological processes new land surfaces were and are still being created which form the biomes for the fauna and flora which gradually evolve and become adapted to the more or less severe climate. The invasion of such islands by plants and animals is a process of fundamental importance for biology. Our studies have taught us that contrary to most other parts of the world, the wind and to a certain extent the ocean currents play a major part in the establishment of the new biota. A number of Invertebrates and many lower plants which disseminate their spores in the atmosphere, such as mosses, liverworts, lichens and ferns, can be brought to the islands by wind. Others arrive there attached to the feathers or feet of some of the millions of birds which make these islands their home. The extremely interesting fact is that the source of these biota lies practically always to the west of the island as the brave west wind with its gales and gusts is the primary source of propagules. It appears that Marion and Prince Edward Islands are fairly young from a biological point of view. Practically no endemic species have yet developed on them, as on the Kerguelen Islands.

Our scientific expedition has studied many aspects of these problems and we have recently moved to a new phase of our research. We would now like to know more about the life of the plant and animal communities on our islands, how they form an integrated whole, how they depend on the physical and chemical environment and on each other. This modern wide ecological approach is of basic value for the understanding of the processes in nature and therefore of our own vital environment. We can conduct these studies on the islands outside the destructive influence of man and these islands are therefore our ideal open air laboratories. It is for these reasons and no less for the intrinsic value of these natural paradises that we should preserve the wealth and beauty of them. The scientific world is most thankful to the South African



Government that it acts as a very conscious and proud warden of this heritage of nature. In this connection I want to clear my reputation of an imputation in your *Antarctic Bulletin* of March 1971, Mr. President, where it said in a report from Marion Island that I introduced trout to the island. I have never done so and I will never do anything which can upset or destroy the delicate balance of these miraculous and rare ecosystems. I have been fighting with as much tact as becomes a loyal citizen of our "banana islands" the willows and the pines which have been introduced to their shores as well as the small greenhouse, the fowl, the sheep and all those things which may become a danger to the vulnerable equilibrium of the biota of these islands. I think that we have been doing very well on our islands if I compare their virgin state with the entire destruction which took place on other islands through the introduction of goats, rabbits, swine and reindeer.

As I said beforehand, our research is at present of an experimental nature. We do not only want to know *what* is living on the islands but *how* these plants and animals live there. This means sophisticated chemical analysis of rocks, soils and plants, determination of the cycle of such elements as nitrogen, tolerance of climatic influences, primary production of food material and the cycle of food in the complicated webs of interdependant organisms. Four young scientists equipped with the best instrumentation have started this new approach. A small, new and modern laboratory will make it possible to continue this and other research in years to come.

At the same time there are many other problems which ask our attention and I would like to touch shortly upon one of them. Geographically our islands Marion and Prince Edward lie halfway between Antarctica and Africa surrounded by a system of cold ocean currents. The climatic regime which is responsible for the ecological setting of these islands has changed greatly in the course of time. The history of Antarctica has probably played a major part in these changes especially since about 4 million years ago when Antarctica changed from a

temperate-subtropical continent into a glacial desert. It is a burning scientific question to know when and how these changes took place and how they can be correlated with the never-ending climatic evolution of our entire globe. The study of these problems is like fitting the pieces of a gigantic jigsaw puzzle together. This is a difficult and tedious game when a number of important pieces are missing. But every new piece that can be put into place assists us in making the picture more clear.

The main problems we are concerned with are the age of the ice ages at the two poles and in other regions of the world, their causes and the influences they had on the energy that drives the circulation pattern of the atmosphere and subsequently of the oceans. It is now widely appreciated that atmospheric processes in all parts of the world are interconnected. An important source of evidence for the Southern Hemisphere is supplied by glaciologists who study the Antarctic ice sheet.

A deep core hole which has been driven through the Antarctic Ice Sheet at Byrd Station revealed extremely interesting information. The age of this 2 164 m core is estimated from measured accumulation rates and is nearly 100 000 years. This enormous ice mass which gradually moves to lower levels is separated from the underlying rock surface by a water layer. The core has provided an unusual opportunity for stable-isotope study especially of the  $O^{18}/O^{16}$  and D/H ratios. The values which have been obtained show that in the course of time the temperature has varied considerably. The curve thus constructed reveals the extremely interesting fact that during a long period from 75 000 to 11 000 years ago the temperature in Antarctica was lower than today. This cold glacial period reached its maximum about 17 000 years ago when the temperature decrease can be estimated to have been 7–8°C. This data is of very great importance as research in many different fields has established that the well-known last glaciation of the Northern Hemisphere had the same duration as the cold period of Antarctica. This evidence strongly supports

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*Marioneiland:  
Kildalkey Baai met  
Greenhill in die agtergrond.  
Op voorgrond Macaroni  
pikkewyne en in agtergrond  
Konings pikkewyne.*

Foto: E. M. van Zinderen Bakker)





sterk winde sal vergemaklik. Daar is ook vir die eerste keer (sover ons weet) veiligheidsligte in die ballonkamer geïnstalleer.

Die bolug afdeling het 'n baie sterk aanval van "gremlins" ondervind. Hul gewildste front was middernag opstygings. 'n Heel paar ballonne het skaars die vereiste hoogte bereik, en die nuwe outomatiese ontvanger het soveel probleme gelewer dat ons die oue van die RSA afgehaal het slegs 'n paar uur voordat die skip sou vertrek.

Die hoogtepunt was natuurlik toe 'n C130 van die S.A. Lugmag hyskraanonderdele per valskerm op die Eiland neergelaat het. Almal hier het die reëlins wat getref is met belangstelling gevolg. Tydens die vlug het ons vir Les van radio bediener tot lugverkeersleier bevorder. Die weer, wat ons grootste kommer was, het saamgespeel. Die valskerms met die houe het almal baie na aan die teiken geval en twee dosyn fotografe

was hoogs tevrede. 'n Paar dae later was die hyskraan weer herstel en ons kon met die aflaaier voortgaan. Die veranderlikheid van Gough weer is bewys toe ons minder as 'n halfuur na die vlug QBI was.

Op die 21ste het ons die vertrekkende RSA met gemengde gevoelens dopgehou. Bly om weer die basis vir ons self te hê, maar jammer om afskeid te neem van die twee vertrekkende spanlede en 'n D.O.W. span met wie ons baie goed saamgewerk het.

Nou word daar elke dag hard gewerk om die Gough Hotel weer tot op 5-ster standaard te bring.

Groete.

J. R. van der Merwe

(Die Nuusbriewe is goedgunstelik deur Die Departement van Vervoer aan die Bulletin voorsien.)

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the idea that during the ice ages the entire globe sustained lower temperatures. The real problem now is that the Antarctic Ice Sheet is much older than the sequence of five glaciations we know from the Northern Hemisphere. The ice cover on Antarctica started to grow about 4 000 000 years ago while the total age of the northern glaciations is estimated to be only 700 000 years. We must in this connection, however, realise that the growth of a glacier not only depends on a lowering in temperature but also on the availability of water vapour for the accumulation of the ice sheet.

The age of the Antarctic glaciation and its consequences is studied in detail by oceanographers who investigate the microfossils such as diatoms, forams, and radiolarians which are found in deep cores taken from the ocean bottom. The age of these cores is assessed with isotope analysis such as K/Ar determinations or with the palaeomagnetic studies of the cores.

The very interesting point now is that the results of our work on Marion Island and also in the whole of Africa is underlined by these new findings. Several years ago Dr. Coetzee in our Palynological Research Unit at Bloemfontein made a study of changes of the former vegetation on the tropical mountains of Africa. She found a strong correlation between the temperature variations of the Northern Hemisphere and tropical Africa. During the last glaciation of the Northern Hemisphere the average temperature in Africa was estimated to have been about 5°C lower than at present. Our study of the former vegetation on Marion Island a few years ago led to similar conclusions for the last 17 000 years. The geologist of our expedition to Marion Island, Professor Verwoerd, described from geological evidence a glaciation which must have covered most of the island roughly between 100 000 and 15 000 years ago.

I strongly feel that from this and more evidence from other parts of the world we can now conclude that the last ice age left its marks over the entire globe at the same

time. This conclusion is of much importance for our understanding of the changes which took place in the oceans. This last glaciation which lasted from about 70 000 to 10 000 years ago is known by different names. In Europe it is called the Würmian or Weichsel, in America the Wisconsin, in Asia the Valdai and in Africa we proposed the name Kenya Glaciation as the important evidence was first discovered there with our pollen analysis.

Research in this field will eventually give us very valuable information on different fields of study such as geology, soil science, climatology, oceanography, geobotany, zoogeography and also on the life and origin of man. I am very happy that we can discuss the physical problems of these questions this year at an international conference which I am organizing for SCAR in Canberra. These conferences are organised by the "Group of Specialists on the Quaternary of the Antarctic". The valuable data we possess from Marion and Prince Edward will be of much use for our discussion because of the geographic position of these "banana islands" between the greatest ice box of the world and the tropical continent of Africa.

Meneer, die President, ek het probeer om u 'n kort skets te gee van die wetenskaplike betekenis van ons Suidpooleilande. Ek het nie die tyd gehad om diep op die betrokke punte in te gaan nie, maar het probeer om te skets dat baie belangrike basiese ondersoek gedoen is en kan gedoen word oor die talle vraagstukke wat aan wetenskaplike probleme van wêreldomvang raak. Hierdie soort van navorsing kan ons alleen doen omdat ons die medewerking het van die Regering en in die besonder van die Departement van Vervoer, van die W.N.N.R. en die Wetenskaplike Komitee vir Antarktiese Navorsing, die Universiteite en ons wetenskaplikes en ook die morele steun van die Suid-Afrikaanse Antarktiese Vereniging. Dit maak dit vir ons moontlik om ons plek vol te staan tussen die hoogontwikkelde lande wat in goeie samewerking met ons streef na die edel doel om



die wondere van ons natuur te leer verstaan. Die wetenskap het 'n voortdurende kontak oor die landsgrense nodig sowel deur geskifte as deur persoonlike ontmoeting. Ek wil die outoriteite dankie sê vir die ruim geleentheid wat ons in hierdie opsigte in ons antarktiese navorsing gebied word.

Monsieur Le Président c'est la coopération avec nos collègues dans les autres pays de SCAR qui est de très grande importance pour nous. Je pense à nos amis et

confrères de l'Angleterre, des Etats-Unis et de tous les autres pays, mais surtout aux savants français avec lesquels nous avons une relation très cordiale. Il me donne une grande satisfaction d'exprimer ici mes remerciements profonds pour le transport de notre équipe scientifique à l'île de Marion, île qui est nommé, comme beaucoup des îles dans l'océan du sud d'après son explorateur français.

Baie dankie Meneer die President.

## NUWE BOEKE-NEW BOOKS

*Dr. C. v. d. M. Brink, President van die WNNR, oorhandig 'n eksemplaar van die boek Marion and Prince Edward Islands aan mnr. B. J. Schoeman, Minister van Vervoer. Die boek bevat 'n verslag oor die Suid-Afrikaanse biologiese en geologiese ekspedisie na die twee eilande gedurende 1965 en 1966. Die Departement van Vervoer sorg vir die finansiering en die logistiek van die land se wetenskaplike ekspedisies na Antarktika en die Suidpoolgebiede. Die WNNR is Suid-Afrika se lidorganisasie in die Internasionale Wetenskaplike Komitee vir Antarktiese Navorsing (Scientific Committee for Antarctic Research - SCAR). As sulks tree die WNNR op as adviseur oor die Antarktiese navorsingsprogram waarvan die betrokke ekspedisie deel was. Dr. F. J. Hewitt, Adjunk-president van die WNNR, is ook voorsitter van die S.A. Wetenskaplike Komitee vir Antarktiese Navorsing wat verantwoordelik is vir die wetenskaplike beplanning van Suid-Afrika se Antarktiese navorsing.*



### MARION EN PRINCE EDWARD EILANDE

'n Prag-uitgawe oor die biologie en die geologie van die Suid-Afrikaanse eilande, Marion en Prince Edward, het pas verskyn. Hierdie twee eilande is van die min plekke op aarde wat nog nie deur die mens bederf is nie.

In 1965/1966 het die Suid-Afrikaanse Wetenskaplike Komitee vir Antarktiese Navorsing (WKAN) 'n ekspedisie daarheen gestuur onder leiding van prof. E. M. van Zinderen Bakker, die bekende paleoëkoloog van die Universiteit van die Oranje-Vrystaat. Hierdie eerste ekspedisie het hoofsaaklik die geologie en die biologie van dié interessante sub-antarktiese eilande bestudeer. 'n Omvattende monografie oor dié werk is pas gepubliseer.

#### Ryklik geïllustreerd

Die ryklik geïllustreerde werk is geredigeer deur E. M. van Zinderen Bakker, J. M. Winterbottom en R. A. Dyer. 'n Groep van 40 wetenskaplikes uit verskillende lande het gehelp met die verwerking van die waarnemings wat deur die ses ekspedisielede gemaak is. Eksemplare van die boek is onlangs oorhandig aan die Minister van Vervoer, mnr. B. J. Schoeman, en ander hooggeplaastes van die Departement wat verantwoordelik is vir die finansiering en

logistiek van Suid-Afrika se wetenskaplike ekspedisies na Antarktika en die Suidpoolgebied.

Die eerste en belangrikste oogmerk van die ekspedisie was om die fisiese en biologiese aard van die eilande te bepaal, skryf prof. Van Zinderen Bakker in sy inleiding tot die monografie. Hoewel sekere gegewens reeds ingesamel is deur vroeëre wetenskaplike besoekers aan die eilande, was die twee eilande, veral Prince Edward, tot 1965 toe nog feitlik onbekend aan die wetenskaplike wêreld.

Hierdie taak is afgehandel deur die ekspedisielede en die groot aantal kollegas uit ander lidlande van die Antarktiese Verdrag wat met die verwerking gehelp het. So is 'n belangrike leemte in die kennis van die sub-antarktiese gebied aangevul.

Hopelik, sê prof. Van Zinderen Bakker verder, sal die resultate van die Suid-Afrikaanse ekspedisie verdere navorsing op hierdie eilande stimuleer en dalk lei tot die vestiging van 'n moderne navorsingstasie op Marion sodat wetenskaplikes van verskillende lande 'n bydrae kan maak tot die kennis oor hierdie twee ongeskonde eilande. Soortgelyke stasies bestaan reeds op ander eilande in die Antarktiese gebied onder beskerming van die Britse, Australiese en Nieu-Seelandse regerings.

*Scientiae Desember 1971.*