Inhoudsopgawe

Hoofstuk I

Reëlings vooraf en verblyf in Pretoria

1.1 Na aanstelling kom ekspedisielede in Pretoria bymekaar op n datum soos aan hulle bekend gemaak. Vir die opleidingstydperk word Pretoria as die hoofkwartier van alle ekspedisielede beskou en geen verblyftoelae sal derhalwe aan ekspedisielede betaal word nie. n Kaart van Pretoria is gerieflikheidshalwe aangeheg.

1.2 Gedurende die laaste gedeelte van November tot voor die vertrek van die ekspedisie na Antarktika aan die einde van Desember sal die hele span in n militêre kamp op Voortrekkerhoogte tuisgaan. Dit is verpligtend dat alle ekspedisielede met hierdie reëling inval aangesien daar gedurende hierdie tydperk intensiewe onderrig in verskillende aangeleenthede soos brandbestryding, kookkuns, liggaamlike opvoeding ensomeer gegee sal word.

1.3 n Spoorwegorder sal aan elke ekspedisielid gestuur word wat hom in staat sal stel om eersteklas per trein na Pretoria te reis. Reis- en verblyftoelae sal tot in Pretoria betaal word. Persone wat nie per trein wil reis nie, kan met hulle eie vervoer na Pretoria afreis en dan die ekwivalent van n eersteklas treinkaartjie teen staatstarief eis. Die ongebruikte spoorwegorder moet aan die Departement terugbesorg word.

1.4 Die koste verbonde aan die verblyf te Voortrekkerhoogte wat ongeveer R1.50 per dag bedra, sal deur ekspedisielede gedra word.

1.5 Tydens verblyf aldaar is ekspedisielede onder militêre gesag en sal gevolglik alle reëlings van die militêre owerhede eerbiedig. Hulle sal in die verband nader deur die kursusleier ingelig word.

1.6 Alle kursusse moet deur alle ekspedisielede bygewoon word. Alle reëlings in verband met programme sowel as persoonlike reëlings moet derhalwe voor samekoms in Pretoria afgehandel word. Slegs in uitsonderlike gevalle sal die Departement bereid wees om n ekspedisielid van sekere kursusse te verskoon.

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1.7 Die ekspedisieleier is die amptelike mondstuk van die ekspedisie en enige probleme moet deur hom met die Departement van Vervoer opgeneem word. Op Voortrekkerhoogte sal hy die Departement via die kususleier nader.

1.8 Soos reeds gemeld, moet alle persoonlike reëlings voor aankoms in Pretoria gefinaliseer wees. Ondervinding het geleer dat die volgende spesiale aandag verdien :

(a) Stel die Ontvanger van Inkomste in kennis dat u vir ongeveer 15 maande in Antarktika sal wees.

(b) Tref die nodige reëlings met u militêre eenheid.

(c) Reël betyds vir enige versekering wat u wil uitneem. Van owerheidswee word u gedek deur die Ongevallewet (Wet No. 30 van 1941 soos gewysig).

(d) Algehele of beperkte volmag kan aan iemand verleen word om tydens u afwesigheid namens u op te tree. Met n algehele volmag kan die gevolmagtigde tjeks uitskryf, dokumente onderteken en op baie ander maniere optree. Beperkte volmag beperk die gevolmagtigde net tot sekere optredes. Stel die Departement asseblief in kennis indien u volmag aan iemand verleen het sodat enige korrespondensie wat na u vertrek ontvang word en aandag vereis, na die persoon verwys kan word.

(e) Dit is wenslik om n testament voor u vertrek te laat opstel. U bank of prokureur sal u verdere inligting verskaf.

(f) Dit is <u>noodsaaklik</u> dat u u tande deeglik laat nasien voor samekoms in Pretoria. Tydens die opleidingstydperk is daar nie tyd daarvoor nie.

(g) Ekspedisielede moet sover moontlik die nodige inspuitings en inentings voor samekoms in Pretoria kry. Distriksgeneeshere sal die nodige doen. Tans word slegs inspuitings teen geelkoors en pokke as noodsaaklik beskou, maar dit staan ekspedisielede vry om ander inspuitings ook te kry. U moet by die Distriksgeneesheer

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aandring om aan u n internasionale inentingsertifikaat te gee vir paspoortdoeleindes. Daarsonder sal u nie toegelaat word om die land te verlaat nie.

1.9 Aansoekvorms om paspoorte sal aan ekspedisielede in Pretoria gegee word en moet sonder versuim terugbesorg word. Elke ekspedisielid word van n amptelike paspoort voorsien. Indien n ekspedisielid in besit van n privaatpaspoort is, moet dit saam met die aansoekvorm aan die Departement besorg word. Na afloop van die ekspedisie moet elke ekspedisielid sy amptelike paspoort aan die Departement terugbesorg, waarna privaatpaspoorte weer aan die houers daarvan oorhandig sal word. Indien die Departement reeds oor n amptelike paspoort vir u besit, moet u nogtans n aansoekvorm om hernuwing voltooi.

1.10 Daar moet met die Hoofrekenmeester van die Departement gereël word oor die beskikking van u salaris. Die reëling geld net ten opsigte van diè persone wat direk deur die Departement betaal word. Andere, soos byvoorbeeld die fisici, moes die nodige reëlings alreeds vroeër met hulle rekenmeesters getref het.

1.11 Dit is belangrik dat reëlings soos bogenoemde nie individueel geskied nie, maar deur die groep as geheel. Die leier sal hiervoor sorg.

1.12 Die verpakking en versending van wetenskaplike apparaat en persoonlike besittings moet met die Kontroleur van Voorrade bespreek word. Alle houers en kratte moet baie duidelik gemerk en betyds, dit wil sê op die laatste 14 dae voor die vertrek van die skip, na die volgende adres gestuur word:

Die Voorradebeampte,
Departement van Vervoer,
Leeuwenstraat 27,
KAAPSTAD.

1.13 Normaalweg word daar geen beperking geplaas op die hoeveelheid bagasie wat n ekspedisielid saamneem nie, maar daar word van ekspedisielede verwag om hul bagasie binne redelike perke te hou.

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Hoofstuk 2

Vertrek van die Ekspedisie na Kaapstad en vertrek na Antarktika van Kaapstad af

2.1 Na afloop van die Departement van Vervoer se kursus in Pretoria word daar aan die ekspedisielede verlof toegestaan om na hulle onderskeie tuistes te gaan totdat die ekspedisie amptelik van Pretoria vertrek.

2.2 Koste verbonde aan die reis na hulle tuiste en hulle verblyf daar word deur hulleself gedra.

2.3 Die ekspedisie vertrek amptelik vanaf Pretoria op 'n gegewe datum. Indien vooraf skriftelik aansoek gedoen word, sal verlof aan ekspedisielede toegestaan word om op 'n gegewe dag by die span in Kaapstad aan te sluit. As die versoek toegestaan word, kan ekspedisielede 'n bedrag van die Departement eis gelykstaande aan wat dit die Departement sou gekos het om die ekspedisielid vanaf Pretoria per trein na Kaapstad te vervoer. Die Departement is slegs verantwoordelik om ekspedisielede tussen Pretoria en Kaapstad te vervoer. Indien 'n ekspedisielid derhalwe ander roetes wil volg, moet hy dit op eie koste doen en kan hy slegs eis vir vergoeding soos hierbo verduidelik.

2.4 Elke ekspedisielid moet 'n verlofvorm voltooi vir die dae waarop verlof geneem word en by die Departement inhandig. Die Departement sal die dae waarvoor verlof benodig word, bepaal en die nodige voorligting gee.

2.5 Persone wat met hulle eie vervoer na Kaapstad afreis, moet die nodige eisvorms voltooi voordat die skip vertrek en aan die Departement se verteenwoordiger oorhandig.

2.6 Die Antarktiese Afdeling is bereid om ekspedisielede in Pretoria, voordat die ekspedisie na Kaapstad vertrek, te help om die eisvorms gedeeltelik te voltooi sodat slegs die ontbrekende gedeeltes in Kaapstad ingevul hoef te word.

2.7 Amptelike vervoer sal slegs vanaf die Kaapstadse stasie na die hawe beskikbaar gestel word vir ekspedisielede wat ampte-

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lik per trein reis. Geen ekspedisielid mag sonder die goedkeuring van die amptelike verteenwoordiger van die Departement van Vervoer van amptelike vervoer gebruik maak nie. Enige versoek om vervoer moet deur die leier aan die verteenwoordiger gerig word.

2.8 Ekspedisielede rapporteer op n gegewe tyd en datum by die amptelike verteenwoordiger van die Departement van Vervoer op die RSA in die Kaapstadse hawe.

2.9 Aangesien ekspedisielede na aankoms in Kaapstad op die RSA tuisgaan, word geen verblyftoelaag toegestaan nie.

2.10. Die span as geheel gaan op n tyd soos aan hom bekend gemaak sal word, na die Voorraadedepot waar beskermende klere uitgereik sal word. Na ontvangs hiervan is ekspedisielede, met goedkeuring van die Departement se verteenwoordiger, vry om te kom en gaan soos hulle wil totdat die RSA vertrek.

2.11 Alle lede van die span moet ten minste twee uur voor die vertrek van die skip aan boord wees. As Doeane en Paspoortbeheer ander tye bepaal, moet daar gevolg aan gegee word. Die vertrektyd van die RSA sal so gou moontlik in Kaapstad bekend gemaak word.

2.12 Alle lede van die ekspedisie is verplig om amptelike onthale in Kaapstad by te woon. Kennis daarvan sal vroegtydig gegee word.

2.13 Geen ekspedisielid mag n onderhoud met die pers of die radio voer sonder die toestemming van die amptelike verteenwoordiger van die Departement van Vervoer nie. Sulke versoeke moet deur die leier gerig word.

2.14 Geen ekspedisielid mag beleidsake met die pers of radio bespreek nie. Die ekspedisielid sal hom uitsluitlik bepaal by persoonlike aangeleenthede en sy werksaamhede op Antarktika.

2.15 Geen ekspedisielid sal, sonder die toestemming van die Kaptein van die RSA, dames in sy kajuit onthaal nie.

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Hoofstuk 3

Op die RSA

3.1 Die Kaptein van die RSA is in absolute beheer van die skip. Elke ekspedisielid is verplig om al sy bevele en opdragte onmiddellik en nougeset uit te voer.

3.2 Elke ekspedisielid is verplig om die gedragsreëls soos neergelê deur die Kaptein na te kom.

3.3 Kajuite word deur die Kaptein toegewys.

3.4 Departementele gaste en waarnemers op die RSA is die verantwoordelikheid van die Kaptein. Dit word egter van ekspedisielede verwag om vryelik met hulle te meng en

(a) die Antarktiese navorsingsprojek te bevorder;

(b) geen beleidsake of politiek met hulle te bespreek nie.

3.5 Elke ekspedisielid is verplig om reddingsoefeninge by te woon.

3.6 Saterdae hou die Kaptein van die RSA kajuitinspeksie. Ekspedisielede moet toesien dat hulle kajuite sindelik is.

3.7 Onder geen omstandighede mag ekspedisielede inmeng met die werksaamhede van bemanningslede, drank aan hulle verskaf, ensomeer nie.

3.8 Maaltye moet stiptelik bygewoon word. Ontbyt is nie verpligtend nie, maar slegs die persone wat stiptelik daar is, sal bedien word.

3.9 Die dra van n das by aandete is verpligtend.

3.10 Stilte sal van 2300 uur gehandhaaf word.

3.11 U word aangeraai om leesstof vir die reis saam te neem.

3.12 Hou kontant byderhand op die heenreis. Die RSA-kantien hou n redelike verskeidenheid artikels teen billike pryse aan. n Pryslys verskyn elders in die handleiding. Transaksies met die kantien geskied streng kontant. Indien krediet aan n ek-

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spedisielid toegestaan word, is dit sy verantwoordelikheid om magtiging aan die Departement te verleen om die verskuldigde bedrag van sy salaris te verhaal en aan die RSA-kantien oor te betaal.

3.13 Ekspedisielede word nie toegelaat om n onbeperkte hoeveelheid bagasie by hulle in die kajuit aan te hou nie. Slegs items wat tydens die reis gebruik sal word, mag aangehou word. Die res moet in die ruim van die skip gebêre word. Dit word aanbeveel dat die volgende kledingstukke en artikels in die kajuit gebêre word :

1 Anarak
1 Trui
Onderklere
Vilt-pantoffels (1 paar)
1 paar werkstewels (Mukluks)
3 Hemde
Das
Handskoene
Bril (2 paar)
Sokkies
Serpe
Toiletbenodigdhede

Hoofstuk 4

Vreemde Basisse

4.1 Dit gebeur soms dat basisse van ander lande besoek word. Dit is hoflikheidsbesoeke en daar word derhalwe van ekspedisielede verwag om hul gashere met respek te behandel en waardige ambassadeurs van die Republiek van Suid-Afrika te wees.

4.2 Geen ekspedisielid mag n vreemde basis besoek tensy hy daartoe aangesê word deur die ekspedisieleier nie.

4.3 Ingevolge die Antarktiese Verdrag mag SANAE ook deur ander Verdragslande besoek word. Die VSA het trouens al die ander lande se basisse gedurende 1967 besoek om vas te stel of die bepalings van die Antarktiese Verdrag nougeset nagekom word.

4.4 Ekspedisielede sal uit hulle pad gaan om die nodige hoflikheid aan sulke besoekers te bewys.

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Hoofstuk 5

Aankoms van die RSA te Antarktika

5.1 Na aankoms is die belangrikste taak die ontskeping van die RSA. Dit is die verantwoordelikheid van die vertrekkende ekspedisie om die wetenskaplike aktiwiteite te SANAE aan die gang te hou terwyl die intrekkende ekspedisie die ontskeping so vinnig moontlik laat plaasvind. Die intrekkende ekspedisie bly dus op die skip totdat alles afgelaai is.

5.2 Vertrekkende ekspedisielede sal hulp verleen met die aflaai waar nodig en moontlik, maar dit word beslis van hulle verwag om die aflaai van sleč by die basis so spoedig moontlik te doen om te verhoed dat daar enige vertraging is. Buitengewone seetoestande vereis dat die skip so gou moontlik na Suid-Afrika moet terugkeer. Dit is derhalwe gebiedend noodsaaklik dat die skip teen die hoogs moontlike versnelling afgelaai word.

5.3 Alle wetenskaplike personeel help ook met die aflaai van die skip enersyds en die sleč by die basis andersyds. Hulle sal slegs van hierdie verpligting vrygestel word indien hul programdirekteure voor die vertrek van die RSA die Departement kan oortuig dat dit werklik noodsaaklik is. Aangesien die vertrekkende ekspedisielede tot met die amptelike oorname van die basis vir alle programme verantwoordelik is, sal toestemming slegs in uitsonderlike gevalle verleen word.

5.4 Beamptes van die Departement van Vervoer en beamptes van ander Departemente of werknemers van ander instansies wat spesiale ondersoeke by die basis moet gaan doen, moet onmiddellik na die basis genoem word. Hulle is vir die duur van hulle verblyf by die basis, dit wil sê tot die amptelike oorname, onder beheer van die leier van die vertrekkende ekspedisie. Alle moontlike hulp sal aan hulle verleen word om hulle ondersoeke doeltreffend en suksesvol uit te voer.

5.5 Beamptes genoem in paragraaf 5.4 sal nie met die aflaai van die skip behulpsaam wees nie tensy ander opdragte gegee word.

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5.6 Nadat die oorhandiging van wetenskaplike programme tot almal se bevrediging geskied het, vind die amptelike oorname van die basis plaas.

5.7 Vertrekkende ekspedisielede sal na die oorname die basis verlaat en op die RSA tuisgaan. Slegs met toestemming van die nuwe leier sal n vertrekkende ekspedisielid toegelaat word om na die oorname in die basis te bly.

5.8 L.W. Tydens gesamentlike ekspedisies, byvoorbeeld met die Belge, is daar soms vliegtuie by die basis. Geen ekspedisielid sal toegelaat word om n plesierrit mee te maak nie aangesien ekspedisielede in geval van n ongeluk, nie van Staatsweë gedek word nie.

Hoofstuk 6

By die Basis

6.1 Daar moet altyd in gedagte gehou word dat SANAE in die eerste plek as 'n navorsingstasie in die lewe geroep is. Alle aktiwiteite moet dus in die eerste instansie toegespits word op die werk wat daar verrig word.

6.2 Die leier van die Antarktiese Ekspedisie is in absolute beheer van die basis en tree namens die Sekretaris van Vervoer op.

6.3 Elke ekspedisielid is verplig om opdragte van die leier uit te voer - hy mag nie weier nie. 'n Ekspedisielid kan, nadat hy die opdrag uitgevoer het en hy die opdrag as onredelik beskou, die aangeleentheid weer met die leier bespreek. As hulle dan nog nie tot 'n verstandhouding kon kom nie, moet die aangeleentheid deur die dissiplinêre komitee, bestaande uit die leier, onderleier en 'n ekspedisielid wat deur die ander lede verkies is, oorweeg word.

6.4 Ekspedisielede sal onder geen omstandighede verskille met die leier met individuele ekspedisielede bespreek en sodoende agterdog teen die leier saai nie.

6.5 Ekspedisielede is verplig om met bestuursake te help.

6.6 Geen ekspedisielid mag enige bestuursake, hetsy per brief of per radiotelefoon met enige persoon buite Antarktika, en dit sluit programdirekteure in, bespreek nie. Bestuursake is die verantwoordelikheid van die Departement van Vervoer. Alle bestuursprobleme word deur die leier by die Departement van Vervoer aanhangig gemaak.

6.7 Ekspedisielede is mede-verantwoordelik vir die huishouding by die basis. Elke ekspedisielid sal op een of ander tyd vir huishoudelike pligte afgesonder word. Elke ekspedisielid is verplig om dit te doen. Die rooster vir huishoudelike pligte sal vroegtydig deur die leier bekend gemaak word. Die leier alleen is gemagtig om beurte uit te ruil. Die enigste gronde waarop dit toegelaat sal word, is siekte of waar 'n per-

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soon se werk gedurende daardie tyd van so n dringende aard is dat hy nie vrygestel kan word nie. Daar sal egter nie toegelaat word dat enige ekspedisielid huishoudelike pligte vryspring nie.

6.8 Huishoudelike pligte moet nougeset uitgevoer word. Onder geen omstandighede mag daar met kos gemors word nie.

6.9 Persoonlike sindelikheid is netso belangrik as in die Republiek en ekspedisielede is verplig om alle vuil klere en beddegoed, komberse uitgesluit, gereeld te was.

6.10 Ofskoon daar nie altyd normale kantoorure soos in die Republiek gehandhaaf kan word nie, moet daar so na as moontlik daaraan gebly word. Ekspedisielede sal bedags werk en snags slaap. Slegs ekspedisielede wie se pligte van so n aard is dat nie hieraan gehoor gegee kan word nie, sal deur die leier tegemoet gekom word. Hierdie opdrag moet streng nagekom word.

6.11 Slaapkwartiere mag vir geen ander doel as vir slaap of rus gebruik word nie. Slaapkwartiere mag nie n vergaderplek vir selfs 2 persone wees nie. Die bymekaarkomplek is die kombuis-, semi-eetkamer en dit moet gehandhaaf word.

6.12 Daar bestaan geen toiletgeriewe in die slaapkwartiere nie en geen toiletfasiliteite mag daar geskep word nie.

6.13 Die leier bepaal die eetgewoontes en ook die etenstye. Geen ekspedisielid sal sonder n wettige en gemotiveerde rede van n ete verskoon word nie. Dit sluit ontbyt in. Die leier is die enigste persoon wat toestemming vir afwesigheid by n ete mag gee.

6.14 Ekspedisielede moet hulle streng by die aanvaarde tafelmaniere hou. Daar moet toegesien word dat daar nie, tot oorlas van ander, daarvan afgewyk word nie.

6.15 Daar is alkoholiese drank by die basis beskikbaar, derhalwe sal onder geen omstandighede toegelaat word dat enige ekspedisielid drank van die skip na die basis bring nie.

6.16 Gesamentlike byeenkomste moet deur alle spanlede bygewoon word.

6.17 Onder geen omstandighede mag vuurwapens of ammunisie deur

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enige ekspedisielid na Antarktika geneem word nie. Indien daar ontdek word dat n ekspedisielid wel n vuurwapen meegeneem het, sal dit onmiddellik deur die leier gekonfiskeer en die saak aan die Departement gerapporteer word.

6.18 Daar is drie gewere en ammunisie vir ontspanningsdoeleindes op Heldedag (10 Oktober) beskikbaar.

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Hoofstuk 7

Geboue, Installasies, Toerusting en Klere

7.1 Geboue en installasies moet behoorlik onderhou word. Alle defekte wat plaaslik herstel kan word, moet onmiddellike aandag geniet.

7.2 Geen verandering aan of byvoeging tot die bestaande elektriese stelsel mag sonder die toestemming van die Departement van Vervoer geskied nie. Indien wysigings nodig is, moet die saak eers met die Departement opgeneem word.

7.3 Die basis met al sy toerusting is Staatseiendom. Daar moet toegesien word dat niks misbruik of gemors word of verlore raak nie.

7.4 Gereedskap en toerusting moet onmiddellik na gebruik op die regte plek gehêre word. Toerusting of voorraad mag geensins verwyder word sonder die medewete van die persoon wat daarvoor verantwoordelik is nie.

7.5 Bergklim- en veldtoerusting moet met groot sorg behandel word. Onthou, menselewens hang daarvan af !

7.6 Na gebruik moet sulke toerusting baie deeglik nagesien word voordat dit gehêre word. Tente moet gedroog en herstel word, primusstowe skoongemaak, yspikke skoongemaak en geghries word ens.

7.7 Enige toerusting wat deur nalatigheid of traak-my-nie-agtigheid beskadig word, sal herstel word op koste van die persoon wat vir die skade verantwoordelik was.

7.8 Daar het in die verlede gevalle aan die lig gekom waar ekspedisielede ekspedisietoerusting en -voorraad vasgelê het. Om n herhaling hiervan te voorkom, sal die volgende prosedure gevolg word :

(a) Voor vertrek uit Suid-Afrika sal elke ekspedisielid n verklaring aan die Departement maak watter waardevolle artikels hy in sy persoonlike bagasie na Antarktika

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noem, byvoorbeeld grammofoonplate, radiostelle, fotografiese apparaat ens. 'n Afskrif van hierdie verklarings sal aan die leier oorhandig word.

(b) Voordat die ekspedisie SANAE verlaat, sal elke ekspedisielid 'n beëdigde verklaring onderteken dat hy niks behalwe sy persoonlike klere, die beskermende klere wat aan hom persoonlik uitgereik is en die waardevolle artikels soos by (a) uiteengesit, na Suid-Afrika terugbring nie.

(c) Geen ongebruikte noodklerasie, voedsel, gereedskap of enige ander toerusting mag van die basis verwyder word nie afgesien van die toestand daarvan.

(d) Indien die vermoede bestaan dat 'n ekspedisielid ongemagtigde toerusting tussen sy bagasie het, sal die leier reël dat die Doeanebeamptes sy bagasie ondersoek. Indien enige basisuitrusting gevind word, sal daar verder teen die ekspedisielid opgetree word in ooreenstemming met die wette op diefstal en meineed.

7.9 Beskermende en ander klere word in Kaapstad aan ekspedisielede uitgereik. 'n Lys daarvan verskyn elders in die handleiding. Daaruit blyk dit dat dit nie nodig is om veel persoonlike klere saam te neem nie.

7.10 Klere wat aan 'n ekspedisielid persoonlik uitgereik is, bly sy eiendom.

7.11 Dit word slegs van ekspedisielede verwag om hul eie toiletbenodigdhede saam te neem.

7.12 Die klere waarvan ekspedisielede voorsien word, is van 'n hoë kwaliteit. Beskermende klere is duur en derhalwe verwag die Departement dat dit behoorlik in stand gehou sal word. Daar is 'n naaimasjien by die basis beskikbaar.

7.13 Om te verseker dat klere goed hou, moet in die eerste plek daarvoor gesorg word dat die regte klere vir die regte omstandighede gebruik word. Verder, gebruik oorpakke en growwe klere vir ruwe werk en om die fyner kledingstukke te beskerm.

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Hoofstuk 8

Noodtoestand

8.1 In geval van nood en waar die veiligheid van die ekspedisie of die basis bedreig word, is die leier gemagtig om, as die toestand dit vereis, alle wetenskaplike programme te staak en alles in die stryd te werp om die noodtoestand die hoof te bied. As 'n ekspedisie in die veld is, sal hulle indien die leier so besluit, dadelik na die basis terugkeer.

8.2 Deur gereelde en doeltreffende inspeksies kan meeste noodtoestande verny word. Inspeksies is dus noodsaaklik en dit bring mee dat sake vroegtydig reggestel kan word voordat 'n noodtoestand ontstaan.

8.3 In geval van nood en wanneer daar na 'n redelike tyd nie met ZUD in verbinding getree kan word nie, moet verbinding met Kaapstadradio (ZSC) bewerkstellig word. ZSC mag alleenlik opgeroep word nadat die leier die nodigheid daarvoor uitgevaardig het.

8.4 Die radiobediener moet toesien dat hy vertroud is met al ZSC se frekwensies en dat ten minste een ander ekspedisielid vertroud is met hierdie noodprosedure.

8.5 Sodra daar met ZSC in verbinding getree is, moet hy versoek word om op enige van die normale bedryfsfrekwensies van die betrokke stasie te luister.

8.6 Nadat daar vir die tweede maal met ZSC kontak gemaak is, moet hy versoek word om ZUD onmiddellik in kennis te stel om met die stasie wat in nood verkeer in verbinding te tree.

8.7 Dit is raadsaam om ZSC te versoek om wag te hou totdat verbinding met ZUD bewerkstellig is.

8.8 Die grootste enkele gevaar in Antarktika is brand.

8.9 Brande kan voorkom word, maar alleen indien alle ekspedisielede ten alle tye brandbewus is.

8.10 Aangesien 'n brand by die basis rampspoedige gevolge vir

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die hele ekspedisie kan hê, is dit lewensbelangrik dat elke lid die gevaar van brand terdeë besef en dat almal daartoe bydra om brandgevaar te voorkom.

8.11 Die Departement van Vervoer sal n Brandbestrydingsbeampte aanstel in oorleg met die leier. Dit word van alle spanlede verwag om hul volle samewerking aan die beampte te gee ten einde sy pligte suksesvol uit te voer. Alle voorskrifte met betrekking tot die voorkoming en bestryding van brand sal stiptelik nagekom word.

8.12 Na aankoms by die basis sal die vertrekkende Brandbestrydingsbeampte die beampte wat by hom oorneem op hoogte bring van die posisie van alle brandbestrydings- en hulpapparaat soos brandblussers, asemhaalapparaat, asbespakke, toue, fluitjies, kortom, alle apparaat wat voorsien is om die basis brandvry te hou sowel as noodrantsoene ens.

8.13 Enige items wat aandag sal verg, moet onmiddellik aan die nuwe Brandbestrydingsbeampte gerapporteer word en moet aandag geniet voordat die skip Antarktika verlaat. Enige toerusting wat nie in n behoorlike werkende toestand geplaas kan word nie, moet onmiddellik na die Republiek gestuur word met n breedvoerige verslag oor die toestand daarvan en die rede waarom dit buite werking is.

8.14 Die brandblustoerusting is met n bepaalde doel op strategiese punte in die basis geplaas. Dis derhalwe noodsaaklik dat die toerusting daar gelaat word en dat elke ekspedisielid hom vergewis van die werking en posisie daarvan. Die volgende tipes brandblustoerusting word tans voorsien en moet soos volg hanteer word :

BRANDBLUSSERS

8.15 Droë poeier (20lb) druktipe. Hierdie blussers is nie herlaaibaar in Antarktika nie. Die hele silinder is onder druk en is gereed vir regop gebruik nadat die seël gebreek en die hefboom afgedruk is. Tydens die gereelde inspeksies moet seker gemaak word dat die plastiek-spuitstuk nog stewig aan die silinderwand vas is aangesien dit geneig is om los te gaan onder die koue

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toestande. Die drukmeter sal aantoon of die lading van die blusser nog in orde is.

8.16 Koolstofdioksiedblussers (5 lb en 10 lb). Hierdie blussers is ook nie herlaaibaar nie en het ook n baie eenvoudige inwerkingstelmeganisme.

8.17 Waterblussers (Koolstofdioksied aangedrewe). Hierdie blussers is die enigste herlaaibare tipe by die basis. Die hervulling is baie eenvoudig. Vul die blussers tot by die aangewese merk met water. Voeg die anti-vriesmiddel by soos aangedui op die houer. Skroef n verseëlde koolstofdioksiedsilinder in, verseker dat dit goed vas is en skroef dan weer die kop van die blusser op en sorg dat die veiligheidsmeganisme in die korrekte posisie is. Die water wat gebruik word moet vry wees van enige onsuiwerhede.

8.18 Droë poeierblussers is veral geskik vir bestryding van brande waarby vloeibare brandstof, byvoorbeeld petrol en olie, betrokke is, maar kan op enige ander brand gebruik word.

8.19 Koolsuurgas is by uitstek geskik vir brand in elektriese en delikate apparaat omdat dit geen nadelige spoor nalaat nie.

8.20 Waterblussers is nie geskik vir vermelde brande nie, maar wel vir brande waarby vaste brandstof soos hout, papier en lap betrokke is.

ASBESKOMBERSE

8.21 Die asbeskomberse moet alternatiewelik weekliks uitgeruil word met die een in die kragkamer sodat dit kan ontdooi. Dit kan nuttig aangewend word om n brand mee te smoor en om te dien as hittewering tydens reddingswerk.

ASEMHALINGSAPPARATE

8.22 Daar is twee tipes apparate in die basis. Hierdie instrumente is waardevolle apparaat ten tye van n brand, derhalwe moet daar gesorg word dat dit altyd in n puik toestand verkeer. Sorg dat dit altyd skoon is en dat dit vry is van ys. Gaan gereeld na of die druk nog voldoende is en indien nodig vervang die silinder met n reserwe een in die basis. Onder geen om-

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standighede moet daar gepoog word om die leë silinders te vul met lug uit enige ander bron nie. Dit kan baie nadelig wees onder Antarktiese toestande.

NOODKAS

8.23 Die Brandbeveiligingsbeampte moet toesien dat daar 'n kas is waarin daar 'n asemhalingsapparaat en 'n 20 lb. droë poeier brandblusser gehou word. Hierdie apparate moet stewig in die kas vas wees sodat dit orals heen vervoer kan word soos byvoorbeeld na die substasie. Aan die kas moet daar 'n stewige tou vas wees sodat die kas byvoorbeeld by die substasie binne in die basis kan bly maar die tou moet bo by die luik vasgemaak word sodat die kas opgehys kan word ingeval van nood.

OUTOMATIESE KOOLSTOFDIOKSIEDBRANDBLUSSTELSEL

8.24 'n Afsonderlike handleiding in die verband sal aan die dieselwerktuigkundiges gegee word.

BRANDBEVEILIGING VAN DIE BASIS

ONMIDDELLIK

8.25 Die nuwe Brandbestrydingsbeampte moet met die leier reël om 'n bestrydingsoefening so spoedig moontlik te laat plaasvind, in elk geval voor 'n tydperk van 48 uur na oorname van die basis verstreke is, dit wil sê voor die vertrek van die skip. Hierdie oefening moet in elke deel van die basis uitgevoer word ten einde ekspedisielede bekend te stel met die stappe wat in noodgevalle gedoen sal word.

DAAGLIKS

8.26 Die Brandbestrydingsbeampte is verantwoordelik vir die veiligheid van die geboue teen brand. Gevolglik moet hy (of ander wat volgens 'n rooster met die leier gereël is) alle kamers van die hoofgebou elke nag inspekteer op 'n tydstip nadat die laaste persoon bed toe is. Indien iemand anders die inspeksie volgens rooster uitvoer, moet die Brandbestrydingsbeampte, voordat hyself gaan slaap, sekor maak dat die persoon ten volle op hoogte is van wat van hom verwag word. Daar sal altyd 'n ekspedisielid snags aan diens wees en gereelde inspek-

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sies in die basis uitvoer.

WEEKLIKS

8.27 Die Brandbestrydingsbeampte moet die basis noukeurig inspekteer en alle stappe doen om brandgevaar uit te skakel. Vuilis moet nie toegelaat word om op te hoop nie.

8.28 Olie mag nie drup of poele op die vloer vorm nie. Indien daar 'n moontlikheid van so 'n toestand mag ontstaan, moet drupbakke voorsien word.

8.29 Hy moet toesien dat waar rook toegelaat word, behoorlike asbakke gebruik word.

8.30 Hy moet toesien dat beamptes altyd brandbewus bly en sal gevolglik weekliks die aandag op gevaarpunte vestig. Die metode van aanbieding wat gevolg sal word om verveling uit te skakel vanweë die gedurige herhaling, sal aan die Brandbestrydingsbeampte oorgelaat word. Kyk ook na die "algemene" paragraaf.

8.31 Gereelde oefeninge, minstens een keer elke twee weke, moet deur die brandbestrydingsbeampte gereël word. Al die ekspedisielede moet, sover moontlik, by sodanige oefeninge betrek word.

8.32 Brandoefeninge sal onder andere die volgende insluit -

(i) Aanwys van spesifieke pligte.
(ii) Reagering op 'n toetsalarm.
(iii) Inneem van voorafbepaalde posisies.
(iv) Gebruikmaking van in- en uitgange.
(v) Skynhantering van toerusting.
(vi) Skynredding (persone en voorrade).
(vii) Skynnoodhulptoepassing.

LW.

8.33 Omdat, in die geval van 'n brand in die basis, verstikkende rook en gasse heelwaarskynlik die vernaamste struikelblok in die weg van brandbestryding en reddingswerk sal wees, moet oefeninge, deur gebruikmaking van asemhalingstoestelle, veral in daardie rigting toegespits word.

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MAANDELIKS

8.34 Dit is nie wenslik om brandblussers te ontlaai nie, aangesien hulle spesiaal gelaai is om Antarktiese toestande te weerstaan, maar elke spanlid moet die blussers hanteer asof om hom met die gebruik daarvan bekend te stel.

OPTREDE IN GEVAL VAN 'N BRAND

8.35 Vanuit die staanspoor moet daar baie duidelik besluit word wat as n brandalarm beskou word. Hieroor mag daar geen misverstand wees nie.

8.36 In geval van n brand moet daar n baie duidelike verdeling van pligte wees. Die volgende dien slegs as leidraad. Elke ekspedisielid moet duidelik verstaan wat van hom verwag word en die hele uiteensetting moet op die kennisgewingbord aangebring word.

8.37 Die volgende indeling vir n ekspedisie van 16 lede kan moontlik gebruik word :

1 lid as brandbeveiligingsbeampte
3 lede vir brandblusspan
2 lede as helpers
2 lede vir asemhalingsapparaat
1 radio-operateur)
1 dokter) vir diens by uitgange
1 werktuigkundige)
1 werktuigkundige by installasies
2 lede vir soekgeselskap
2 lede vir verwydering van dokumente en klere.

8.38 Almal haas na die woonkwartier (eerste keuse), die danssaal (tweede keuse) of dan na die uitgang by die noodkragkamer. Almal moet so gou moontlik uitkom maar met soveel moontlik klere aan. Hier sal die brandbeveiligingsbeampte of die leier nagaan wie nie teenwoordig is nie asook om ander opdragte uit te reik.

8.39 Die drie manne wat aangewys is om die brand te bestry, gaan egter onmiddellik na die brand, maar hulle moet sorg dat

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hulle op pad soontoe aan iemand sê dat hulle alreeds met hul taak besig is. Hierdie drie manne moet die werking van elke tipe brandblusser op elke tipe brand baie deeglik ken.

8.40 Dit sal twee manne se taak wees om die drie manne wat met die bluswerk gemoeid is onmiddellik te gaan help nadat hulle aangemeld het. Hierdie twee moet addisionele blussers aandra of enige ander toerusting wat deur die bestryders benodig word. Dis dus duidelik dat hierdie twee presies moet weet waar alle toerusting op die basis is.

8.41 Twee manne moet ook aangewys word om onmiddellik twee asemhalingsapparate te neem en na die brand te gaan aangesien rook die oorweldigende faktor is by n brand. Die apparate moet vinnig maar sorgvuldig aangetrek word sodat dit absoluut betroubaar is. Die aanstelling van hierdie twee manne sal deur een faktor bepaal word, naamlik die persoon se baard. Die twee manne met die kleinste of geen baard sal dus vir hierdie taak aangewys word. Dit kan dus beteken dat daar verandering van pligte sal wees soos wat lede hul baard afsny. Die twee manne moet regstaan om die gebied van die vuur binne te gaan maar hulle moet altyd twee-twee wees en wanneer een alleen vorentoe beweeg moet hy met n tou aan die ander verbind wees en hierdie twee mense moet n baie besliste kode met die tou hê soos byvoorbeeld :

Een kort plukkie - alles nog reg - laat skiet
Twee harde plukke - gevaarlik ek kom uit
Drie kort plukkies - stuur die ander apparaat in.

8.42 Die radiobediener, n werktuigkundige en die dokter moet na die luike gaan met toue en moet wag op bevele om die luike toe te maak soos wat omstandighede dit vereis.

8.43 Die tweede dieselwerktuigkundige moet toesien dat alles nog onder beheer is in die kragkamer, indien brand nie daar is nie, in welke geval hy onmiddellik na die noodkragkamer moet gaan en daardie eenheid aan die gang kry.

8.44 Indien daar manne vermis word, moet ten minste twee aangesê word om na hulle te gaan soek sodat vasgestel kan word of hulle nie dalk in die brand vasgekeer is nie.

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8.45 Die laaste twee manne moet gereed wees om op bevel van die leier belangrike dokumente wat op bepaalde plekke gehou word waarvan hulle vooraf kennis dra, te verwyder en as die tyd en omstandighede dit toelaat moet addisionele klere ook verwyder word.

ALGEMEEN

8.46 Die Brandbestrydingsbeampte moet toesien dat die volgende brandvoorsorgmaatreëls nagekom word en daarom word dit van alle spanlede verwag om na die beste van hul vermoë saam te werk :

(1) daar moet streng op rookgewoontes gelet word. Ten alle tye moet asbakke gebruik word wat gereeld leeggemaak moet word. Almal moet probeer om die gewoonte aan te leer om 30 minute voor slaaptyd nie meer te rook nie. Dit is om die enkele geval van 'n laaste sigaret of pyp wat tot 'n verwoestende brand aanleiding mag gee, uit te skakel.

(2) Die Brandbestrydingsbeampte mag nie toelaat dat die elektriese bedrading verander word nie tensy goedkeuring van die Departement van Vervoer verkry is of 'n DOW-inspekteur die verandering ter plaatse goedkeur. Kyk ook par. 7.2.

(3) Die Brandbestrydingsbeampte moet toesien dat niemand by die basis enige elektriese, gas- of olie-aangedrewe apparaat gebruik wat moontlik 'n brand kan veroorsaak nie tensy dit spesifiek vir gebruik deur die Sekretaris van Vervoer goedgekeur is.

(4) Die Brandbestrydingsbeampte moet toesien dat ontvlambare vloeistowwe slegs in die goedgekeurde plekke gebruik en gebêre word. Hy moet homself daarvan vergewis dat brandstofopslagplekke goed genoeg versprei is ten opsigte van mekaar en moontlike bronne van gevaar, om die verspreiding van brand te voorkom.

(5) Die Brandbestrydingsbeampte moet voortdurend waak teen die volgende gewoontes wat maklik aanleiding

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tot 'n brand kan gee. Ekspedisielede word dringend versoek om hom by te staan om hierdie gewoontes uit te skakel :

(a) Trek vuurhoutjies altyd afwaarts, naby aan die dosie. Moet nooit 'n vuurhoutjie opwaarts trek nie; dit kan breek en 'n brand veroorsaak voordat die brandende koppie geblus kan word.

(b) Let daarop dat 'n vuurhoutjie dood is voordat dit weggegooi word - in 'n asbakkie.

(c) Druk sigaretstompies dood. Maak pype leeg voordat u dit na 'n rokie neersit.

(d) Ledig asbakkies sodra hulle vol is en nie in houers wat papier of ander ontvlambare materiaal bevat nie.

(e) Moenie iets in die donker met behulp van vuurhoutjies soek nie; gebruik 'n flits.

(f) Rook in beddens is absoluut verbode behalwe as die persoon in die hospitaal is en dan slegs onder toesig.

(g) Rook of oop ligte (vlamme) moet onder geen omstandighede toegelaat word in enige stoor of gebou wat brandbare of ontvlambare voorrade in groot hoeveelhede bevat nie.

(h) Indien enige vloeibare brandstof, lig of verwarmer gebruik word, moet dit nie onnodig in gebruik bly as die gebou of kamer vir 'n ruk verlaat word nie. Indien dit moet bly brand, moet spesiale voorsorgmaatreëls getref word en te alle tye toegepas word, byvoorbeeld die apparaat moet nagesien word voordat die kamer ontruim word.

(i) Klere moet nie gedroog of gelug word voor verwarmers anders as in die goedgekeurde droogkamer nie.

(j) Geen brandblusser of enige apparaat moet verwy-

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der word van die posisies waarin hulle agtergelaat word nie. Indien n brandblusser gebruik is, verwyder dit onmiddellik van die plek waar dit normaalweg gehou word en stoor dit. Indien dit nie van die herlaaibare soort is nie, moet dit met dieselfde tipe vervang word. Die watertipe blusser kan egter herlaai word (soos voorheen verduidelik) en moet teruggeplaas word op die oorspronklike posisie.

(k) Die afvaldromme moet verwyder word na n gang of elders waar dit nie brandrisiko sal skep nie. Dit moet nie in die kragkamer gehou word nie.

(l) Nooduitgange moet ten alle tye bruikbaar wees.

BRANDBESTRYDINGSBEAMPTE

Die volgende vereistes is veral van toepassing op die Brandbestrydingsbeampte, maar moet altyd deur die wat hom bystaan in gedagte gehou word :

(a) Brandblusapparaat, asemhaalapparaat en alle hulptoerusting moet weekliks nagesien word om te verseker dat dit in n goeie, werkende toestand is.

(b) Daar moet deeglik boekgehou word van alles wat gedoen is met betrekking tot die veiligheid van die basis teen vuur. Die Brandbestrydingsbeampte moet n verslag aan die Departement laat toekom waarin alles uiteengesit is.

(c) Die Brandbestrydingsbeampte moet in oorleg met die leier toesien dat voldoende noodvoorrade komberse, klere, kos, mediese en noodhulptoerusting in geskikte houers in n veilige plek bewaar word. Hierdie plek moet in n noodgeval maklik bereikbaar wees, maar origens moet daar nie mee gepeuter word nie.

Hoofstuk 9

Vervoer

9.1 Die leier magtig die gebruik van vervoer in oorleg met die senior werktuigkundige. Hy sal alleen ekspedisielede wat behoorlik deur die werktuigkundiges onderrig en as bestuurders goedgekeur is, magtig om meganiese vervoermiddels te bestuur. Alle ekspedisielede sal voor die vertrek uit Kaapstad onderrig ontvang in die bestuur van die verskillende voertuie.

9.2 Die gebruik van honde en sleë sal alleen gemagtig word as daar 'n bevoegde persoon beskikbaar is wat in staat is om die honde te hanteer.

9.3 Die werktuigkundiges se opdragte in verband met die hantering van voertuie moet stiptelik nagekom word.

9.4 Geen voertuig mag die basis verlaat sonder dat dit vergesel is van 'n werktuigkundige nie wat dan ook as bestuurder van die voertuig sal optree.

9.5 Na elke voltooide rit moet die verantwoordelike persoon wat die voertuig bestel het, sorg dat die defekte op die betrokke voertuig se TV 6/1-werkkaart vir die betrokke maand aangebring word - 'n voorbeeld verskyn in die bylaag.

9.6 Die senior werktuigkundige of werktuigkundige sal so gou moontlik die opdragte wat op die TV 6/1-werkkaart aangebring is, uitvoer en agterop die werkkaart die onderdele invul wat nodig was om die voertuig te herstel.

9.7 Die senior werktuigkundige sal verantwoordelik wees vir die bestelling sowel as uitreiking van onderdele. Hy sal ook ten minste een maal per jaar, voordat hy sy bestelling plaas, dit wil sê ongeveer Junie/Julie, die Departement voorsien van sy fisiese voorraad.

9.8 Elke voertuig moet voorsien wees van 'n kassie wat noodonderdele bevat. Daar word voorgestel dat die volgende onderdele altyd daarin beskikbaar sal wees :

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1 klos
1 kondensator
6 vonkproppe
6 waaierbande
1 verdelerkop
1 stel pinte
1 dryfas
1 vergasser
1 brandstofpomp
boute en moere
vriesweermiddel.

9.9 Sodra daar van bogenoemde onderdele uit die kassie verwyder word, moet dit deur middel van die TV6/1-werkkaart vir die betrokke voertuig aangevul word uit die voorraad by die basis.

9.10 Voordat n voertuig gebruik word, moet die bestuurder toesien dat daar voldoende brandstof, olie en vriesweermiddel in is asook oorlewingstoerusting, dit wil sê kos, klere ens.

9.11 Die bestuurder van die voertuig moet ook na elke rit die logboek wat in die kajuit van die voertuig gehou word voltooi, dit wil sê die rit onderneem na ..... en enige defekte ondervind. n Voorbeeld verskyn in die bylaag.

9.12 Werkkaarte moet maandeliks afgesluit word. Hulle moet maandeliks deur die leier en senior werktuigkundige nagegaan en geparafeer word.

9.13 Die voltooide werkkaarte en logstate moet aan die einde van elke ekspedisie aan die Departement terugbesorg word deur die leier.

9.14 Die twee swakste Muskegs en motorsleë moet aan die einde van elke ekspedisie na die Republiek teruggestuur word vir algehele opknapping. Daar moet betyds met die Departement in dié verband oorleg gepleeg word.

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Hoofstuk 10

Medies

10.1 Mediese sake is uitsluitlik die geneesheer se verantwoordelikheid maar die leier is verplig om toe te sien dat die voorskrifte nagekom word.

10.2 Voor vertrek na Antarktika sal die geneesheer 'n kort opknapperskursus by die Geneesheer-generaal ondergaan.

10.3 Die geneesheer moet sorg dat mediese voorraad en instrumente agter slot en grendel gehou word. Gewoontevormende medisyne moet veral deeglik beheer word en die nodige register soos voorgeskryf deur die Geneeskundige Raad moet bygehou word.

10.4 Indien die geneesheer hulp uit Suid-Afrika nodig het, moet die Sekretaris van Vervoer versoek word om mediese bystand te reël. Die soort mediese bystand wat verlang word moet gespesifiseer word. In die geval moet gereelde kontak met Derdepoortradio bewaar word.

10.5 Tydens ongevalle of beserings aan diens word ekspedisielede van Departementswee gedek deur die Ongevallekommissaris kragtens die bepalings van die Ongevallewet.

10.6 Alle ongevallevorms, dit is WCL-vorms, behoort soos volg voltooi te word :

(a) Rapport van ongeluk - word deur werkgewer voltooi.

(b) Eerste vorderings- en finale mediese verslae word deur die betrokke geneesheer voltooi.

10.7 By SANAE kan die leier aan die vereiste by (a) voldoen en die geneesheer aan (b). By terugkeer in die Republiek moet die reeds voltooide vorms aan die Departement oorhandig word vir finale afhandeling. Die geneesheer moet seker maak dat daar voldoende vorms by die basis beskikbaar is.

10.8 Daar moet ook deeglik rekord gehou word van enige siektetoestand wat voorgekom het en behandeling insluitende die toediening van medisyne, wat toegepas is. 'n Kaartrekord volgens die voorbeeld in die bylaag, moet ten opsigte van elke ekspedi-

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sielid bygehou en na afloop van die ekspedisie aan die Departement oorhandig word.

10.9 Daar moet ook register gehou word van die uitreiking van alle medisynes. Die inligting moet na afloop van die ekspedisie aan die Departement oorhandig word.

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Hoofstuk 11

Amptelike Korrespondensie en Telefoonverbinding

11.1 Alle berigte, behalwe persoonlike briewe aan naasbestaandes en vriende in die Republiek, word aan die Sekretaris van Vervoer gerig. Geen berig word direk aan enige staatsdepartement of enige ander instansie wat met Antarktiese Sake gemoeid is, gerig nie. Die Sekretaris van Vervoer se kodeadres moet gebruik word, naamlik PAHQYSEG.

11.2 In geval van nood buite kantoorure moet die boodskap gerig word aan die noodadres wat aan elke ekspedisie bekend gestel sal word. Tans is dit mnr. C.J.J. van Rensburg, Mofinhof 15, Troyestraat, Sunnyside, Pretoria, telefoon 49882.

11.3 Amptelike berigte kry voorkeur bo alle ander berigte en persoonlike briewe. Navrae deur die Sekretaris van Vervoer moet onmiddellik aandag geniet.

11.4 Die volgende voorrang geld ten opsigte van berigte :

(a) Dringende administratiewe berigte.
(b) Weerkundige en seismologiese gegewens.
(c) Algemene administratiewe berigte.
(d) Algemene wetenskaplike resultate.
(e) Privaatkorrespondensie en telegramme.

11.5 Die radiobediener sal nie n berig afstuur nie tensy dit deur die leier geparafeer is.

11.6 Amptelike radiotelefoonverbinding vind tweeweekliks tussen ekspedisielede en meeste van die programdirekteure plaas. Tydens hierdie oproepe moet ekspedisielede hulle beperk tot hulle spesifieke navorsingsprogramme en nie oor koeitjies en kalfies gesels nie.

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Hoofstuk 12

Privaatkorrespondensie, Blombestellings en Radiotelefoonverbinding

12.1 Ekspedisielede mag elke week kosteloos briewe van familielede en/of vriende ontvang en ook aan hulle stuur. Die volgende voorwaardes moet egter nagekom word :

(i) Al die briewe saam mag nie 150 woorde oorskry nie. Indien 'n ekspedisielid se kwota vir 'n bepaalde week reeds vol is en nog briewe word ontvang, sal hulle noodwendig tot die volgende week oorgehou word en dan oorgesein word mits sy kwota vir daardie week dit toelaat. Ekspedisielede moet dus gepaste reëlings met korrespondente tref om die beperking van 150 woorde per week te handhaaf.

(ii) Amptelike berigte geniet voorkeur bo briewe.

12.2 Privaatkorrespondensie mag op geen ander wyse as deur bemiddeling van die Departement van Vervoer gestuur word nie.

12.3 Voor hulle vertrek uit die Republiek moet ekspedisielede die volgende onder aandag van hul korrespondente bring :

(i) Alle briewe vir versending na Antarktika moet gestuur word aan :

Mnr. (naam van ekspedisielid), SANAE ...,
P/a. Die Algemene Afdeling,
Departement van Vervoer,
Privaatsak 193,
PRETORIA.

(ii) Briewe moet òf getik, òf in drukskrif geskryf wees. Die naam van die persoon aan wie die brief gaan asook waar hy gestasioneer is, moet ook duidelik op die brief verskyn, byvoorbeeld brief aan B. Benade, Antarktika. Aan die einde van elke brief moet korrespondente duidelik die aantal woorde aandui.

12.4 Briewe wat onduidelik is of waarvan die aantal woorde nie aangedui is nie, sal nie versend word nie.

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12.5 Ofskoon 150 woorde per week min klink, moet onthou word dat Britse ekspedisielede 200 woorde per maand mag ontvang en slegs 100 per maand mag stuur. Indien die kwota oorskry word, is een pennie per ekstra woord betaalbaar!

12.6 Bogenoemde geld nie tydens oornametydperke nie. Dan word slegs 50 woorde per persoon per week toegelaat vanweë die groot getal persone by die basis. Lig u korrespondente asseblief so in en versoek hulle om nie te skryf voordat die skip by SANAE aangekom het nie. Die nuus sal oor die radio en in die pers bekend gemaak word.

12.7 Elke spanlid sal voor vertrek uit Suid-Afrika aan die leier die volgende oorhandig :

(a) 'n Lys van persone met hul adresse met wie hy van plan is om te korrespondeer.

(b) Voldoende gefrankeerde koeverte vir sy korrespondensie.

12.8 Die leier sal dan 'n lys van al die adresse opstel en aan elk 'n nommer toeken. 'n Afskrif van die lys sal aan die Departement van Vervoer voorsien word en ook aan elke spanlid 'n afskrif van sy adresse en nommers. Elke brief vanaf Antarktika sal die nommer van die bestemming twee maal bevat om oorseinfoute te voorkom.
Die nommers sal voorafgegaan word deur die letter S.

12.9 Die volgende dien as voorbeeld. Indien mnr. W.J. van Zyl (ekspedisielid op Antarktika) aan mnr. F. Lourens, Posbus1, Calitzdorp, skryf en kodeletter S14 is aan F. Lourens toegeken, hoef slegs geskryf te word :

Brief Van Zyl, SANAE, aan S14.

12.10 Ekspedisielede wat koeverte sonder seëls of seëls sonder koeverte inhandig, se briewe sal nie aanvaar word nie. Lugbriewe word nie aanvaar nie. U word aangeraai om 'n paar blanko koeverte met seëls ook aan die Departement te oorhandig in geval u sf en toe met iemand wil korrespondeer wie se naam nie op die adreslys voorkom nie.

12.11 Briewe moet in telegramstyl geskryf word. Sodoende word baie woorde bespaar.

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12.12 Briewe met die volgende inhoud sal nie versend word nie :

(i) Briewe wat die Departement of Staat in die verleentheid kan bring of kritiseer. Indien 'n ekspedisielid of van sy naasbestaandes van mening is dat hulle in een of ander saak verontreg is, moet hulle die saak aan die Departement voorlê wat dit behoorlik sal ondersoek.

(ii) Briewe van omstrede aard wat indruis teen maatskaplike sedes byvoorbeeld briewe met onwelvoeglike taal. Sulke briewe sal aan die Posmeester-generaal oorhandig word vir sodanige optrede as wat hy mag nodig ag.

12.13 In geval van nood mag korrespondente in die Republiek telegramme aan ekspedisielede stuur. Telegramme moet soos volg geadresseer word :

Mnr. (naam van ekspedisielid), SANAE ...,
P/a. Algemene Afdeling,
Departement van Vervoer,
H/v. Bosman- en Strubenstraat,
PRETORIA.

12.14 Telegramme moet asseblief tot die absolute minimum beperk word.

12.15 Aangesien ekspedisielede vroegtydig reëlings in verband met gelukwensings en so meer kan tref, bestaan daar geen rede waarom telegramme van Antarktika gestuur moet word nie. Slegs noodgevalle regverdig telegramme. In sulke gevalle sal die koste van die betrokke ekspedisielid se salaris verhaal word op voorwaarde dat die Hoofrekenmeester die toestemming van die ekspedisielid het om aftrekkings hiervoor van sy salaris te maak. Korrespondente mag nie van kode gebruik maak nie. Sulke boodskappe sal nie by die basis of by die Departement van Vervoer ontvang word nie.

12.16 Die volgende reëlings is getref vir die wêreldwye versending van blomme aan ekspedisielede se naasbestaandes deur die diens van "Interflora". Bestellings word per teleks vanaf Antarktika gestuur en moet soos volg bewoord wees: Aan Interflora, P/a. Die Hoof, Algemene Afdeling, PAHQYGEG. Ruiker Vyf Rand.

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Naam en adres van ontvanger (syfers moet voluit geskryf word). Kodenommer van gepaste boodskap soos hieronder aangedui. Persoonlike boodskappe kan in plaas van die kodeboodskappe gestuur word. Indien die aansoek in Engels gedoen word, sal die boodskap in Engels vertaal word.

12.17 Boodskappe :

GEBOORTES:	
VYFNULEEN	Veels geluk met die nuwe baba. Mag die toekoms vir julle slegs vreugde en voorspoed inhou.
VYFNULTWEE	Veels geluk my liefling. Mag God julle albei ryklik seën. Verlang natuurlik baie. Innige liefde.
VERJAARSDAE:	
VYFNULDRIE	Veels geluk my liefling. Mag God jou ryklik seën. Verlang natuurlik baie. Baie liefde.
VYFNULVIER ..... (Gevolg deur naam van kind)	Veels geluk met jou verjaarsdag ..... Wees soet en gehoorsaam. Pappa verlang baie. Baie liefde.
VYFNULVYF ..... (Moeder, Vader ens.)	Veels geluk met ..... se verjaarsdag. Mag God u ryklik seën en lank spaar. Liefde.
VYFNULSES	Veels geluk met geboortedag. Mag daar nog baie wees. Beste groete.
KERSFEES EN NUWEJAAR:	
VYFNULSEWE	Gesegende Kersfees en n voorspoedige nuwejaar my liefling. Jy is altyd in my gedagtes. Innige liefde.
VYFNULAGT	Gesegende Kersfees en n voorspoedige nuwejaar. Baie liefde.

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GELUKWENSING:

VYFNULNEGE ..... Veels geluk met die pragtige prestasie. Ek is trots op jou.

VERLOWINGS EN HUWELIKE:

VYFEENNUL ..... Hartelik geluk met die groot stap. Mag die toekoms net geluk en voorspoed inhou.

MOEDERSDAG:
(tweede Sondag in Mei)

VYFEENEEN ..... 'n Geseënde Moedersdag, liefste Moeder. U is altyd in my gedagtes en gebede. Innige liefde.

SIEKTE:

VYFEENTWEE ..... Met al my beste wense vir 'n spoedige herstel.

AFSTERWE:

VYFEENDRIE ..... My innige meegevoel in hierdie donker uur van beproewing.

ALGEMEEN:

VYFEENVIER ..... Sommer 'n paar blommetjies om te sê ek dink nog altyd aan jou. Met al my liefde.

VYFEENVYF ..... Ons kuier nog lekker, maar vanaand verlang ek darem so bietjie huis toe.

VYFEENSES ..... Die tyd gaan gou verby en ons is binnekort weer bymekaar.

VYFEENSEWE..... Hierdie blommetjies bewys dat ek veilig aangekom het.

VYFEENAGT ..... Met al my liefde en goeie wense. Ek verlang oneindig baie. Liefdegroete.

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VYFTIENNEGE ..... Ek kan nie meer wag dat die tyd moet aanbreek om huiswaarts te keer nie. Ek mis jou oneindig baie. Met al my liefde.

VYFTWEENUL ..... Net n paar blommetjies om te sê dat ek jou innig liefhet en altyd aan jou dink. Liefdegroete.

12.18 Die bestelling moet minstens twee weke voor die tyd geplaas word. Indien n bestelling moet gaan na n plek waar Interflora oor geen aflewerings fasiliteite beskik nie, behou hulle die reg voor om aan die ontvanger n blombewys te stuur wat binne n jaar vir vars blomme ingeruil kan word.

12.19 n Rekening sal maandeliks aan die Departement in die naam van die besteller voorgelê word wat van sy salaris verhaal sal word. Die nodige magtiging moet aan die Hoofrekenmeester gegee word om sulke bedrae van die ekspedisielid se salaris te verhaal. Ruikers, kranse ens. met n minimumwaarde van R3.00 is beskikbaar.

12.20 Die Departement sal een keer per maand reël vir radiotelefoonverbinding tussen ekspedisielede en hul naasbestaandes. Die koste verbonde aan die oproepe word deur ekspedisielede gedra en sal van hul salarisse verhaal word. Daar word 9 minute vir elke oproep toegestaan. Ekspedisielede is beperk tot een oproep. Bespreking van die oproepe moet minstens 14 dae voor die tyd gereël word met vermelding van die telefoonnommer en ontvanger van die oproep in die Republiek.

12.21 Amateurradioverbinding word toegelaat op dieselfde voorwaardes as wat in die Republiek van toepassing is. Amateur radiobedieners moet in besit wees van n geldige lisensie wat deur die Poskantoor uitgereik is. Ekspedisielede moet self voor hul vertrek uit die Republiek hiervoor reël. Alle amateurradio-aktiwiteite moet in oorleg met die leier, die radiobediener en die radiotegnikus geskied. Onder geen omstandighede mag amateuraktiwiteite met die normale radioverbindingsprogram inmeng nie.

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Hierdie stokperdjie is onderhewig aan Internasionale regulasies en daar moet ten alle tye daarby gehou word. Skriftelike toestemming moet ook van die Departement verkry word om as radio-amateur op te tree.

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Hoofstuk 13

Beskerming van Fauna en Flora

13.1 Ingevolge n ooreenkoms tussen die Antarktiese Verdragslande moet die fauna en flora in Antarktika beskerm word.

13.2 Die Sekretaris van Vervoer is verantwoordelik vir die uitvoering van die ooreenkoms in daardie gebied van Antarktika waar ons navorsing doen.

A. ALGEMEEN

13.3 Die leier sal toesien dat die reëls soos hieronder gestipuleer te alle tye streng nagekom word. Dit is ook van toepassing op waarnemers en gaste van die Departement.

13.4 Hierdie reëls is van toepassing op die gebied suid van 60° Suiderbreedte hetsy dit water, land of ys insluit.

13.5 Vir die toepassing van hierdie reëls het die volgende woorde die volgende betekenisse :

(a) "Inheemse soogdier" beteken enige lid, op enige stadium van sy lewensloop, van enige soort wat behoort aan die klas Mammalia inheems aan Antarktika of wat daar voorkom as gevolg van enige natuurlike manier van verspreiding.

(b) "Inheemse plant" beteken enige soort plantegroei op enige stadium van sy lewensloop (insluitende saad) inheems aan Antarktika of wat daar voorkom as gevolg van enige natuurlike manier van verspreiding.

(c) "Inheemse voël" beteken enige lid, op enige stadium van sy lewensloop (insluitende eiers), van enige soort van die klas Aves, inheems aan Antarktika of wat daar voorkom as gevolg van enige natuurlike manier van verspreiding.

(d) "Toegewese gesag" beteken enige persoon of instansie wat deur die Regering van die Republiek van Suid-Afrika volmag verleen is om permitte uit te reik.

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(e) "Permit" beteken n formele geskrewe toestemming wat uitgereik is deur n "toegewese gesag".

B. REELS

13.6 Permitte

(a) Die doodmaak, wond, vang of molesteer van inheemse soogdiere of voëls of enige poging om so iets te doen word verbied tensy dit uitdruklik deur n permit toegestaan word. Elke permit sal volledige voorskrifte bevat oor wat gedoen moet word.

(b) Sulke permitte sal alleen vir die volgende doeleindes toegestaan word :

(i) Om voedsel wat onontbeerlik is vir honde en ekspedisielede te voorsien.

(ii) Om monsters vir wetenskaplike studie of inligting te bekom.

(iii) Om monsters vir museums, dieretuine of ander opvoedkundige of kulturele instellings te bekom.

(c) Permitte sal alleen onder die volgende voorwaardes toegestaan word :

(i) Geen meer inheemse soogdiere of voëls sal in enige jaar weggeneem of doodgemaak word as wat deur natuurlike aanwas in die volgende teelseisoen teruggeplaas kan word nie.

(ii) Die verskeidenheid van soorte en die balans van die natuurlike ekologiese sisteme moet behou word.

13.7 Geen dier of plant, hetsy dood of lewendig mag uit Antarktika verwyder word sonder die skriftelike toestemming van die Sekretaris van Vervoer nie. Dit geld ook vir diere en plante wat aan n natuurlik oorsaak dood is.

13.8 Bemoeiing met lewensomstandighede van voëls of diere.

(a) Ten einde nie die normale lewensomstandighede van voëls of diere te versteur nie moet die volgende baie streng nagekom word :

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(i) Honde mag nie toegelaat word om vry rond te hardloop nie.

(ii) Daar moet op so 'n wyse met helikopters en vliegtuie gevlieg word dat dit nie onnodig voël- en robbekonsentrasies versteur nie. Daar mag ook nie naby sulke konsentrasies geland word nie.

(iii) Voertuie mag ook nie onnodig naby voël- of robbekonsentrasies bestuur word nie, byvoorbeeld binne 'n afstand van 200 meter.

(iv) Plofstowwe en vuurwapens mag nie naby sulke konsentrasies gebruik word nie.

(v) Enige versteuring van voël- en robbekonsentrasies gedurende die broeiseisoen deur persone per voet is verbode.

(vi) Behalwe vir (i) en (iv) mag persone naby sulke kolonies kom indien die op- en aflaai van voorrade dit noodsaaklik maak.

(b) Water in die omgewing van die kus en ysbanke moet sover as moontlik beskerm word teen besoedeling.

13.9 Inbring van huisdiere en huisplante

(a) Die volgende diere en plante mag na Antarktika gebring word :

(i) Sleehonde.

(ii) Huisdiere en huisplante.

(iii) Diere of plante vir laboratoriumdoeleindes.

(b) Geen ander diere of plante sal na die gebiede gebring word nie behalwe met spesiale toestemming van die toegewese gesag.

(c) Alle sleehonde wat na Antarktika gebring word, moet teen die volgende siektes ingespuit wees :

(i) Hondesiekte.

(ii) Aansteeklike hondelewerontsteking.

(iii) Hondsdolheid.

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(iv) Leptospirasis (L. canicola en L. ichterohaemorrhagicae).

(v) Elke hond moet ten minste twee maande voordat dit op Antarktika aankom ingespuit word.

(d) Indien enige dier of plant die natuurlike sisteem sal beskadig as dit onbewaak gelaat word, sal sorg gedra word dat dit onmiddellik vernietig word.

(e) Alle diere en plante genoem onder para. 13.9(a)(i)(ii) en (iii) sal onmiddellik na Suid-Afrika teruggebring word sodra hulle hulle doel gedien het.

Sekere gebiede in Antarktika is van buitengewone belang en staan bekend as "Spesiaal Beskermde Gebiede". Bykomende beskermingsmaatreëls word ten opsigte van hierdie gebiede getref en die volgende is verbode :

(a) Die versameling van enige inheemse plant of dier behalwe in ooreenstemming met n permit.

(b) Die gebruik van enige voertuig.

13.10 n Normale permit sal nie van krag wees in hierdie spesiale gebiede nie. Spesiale permitte sal net onder die volgende omstandighede uitgereik word :

(a) As dit benodig word vir n noodsaaklike wetenskaplike studie wat op geen ander plek uitgevoer kan word nie.

(b) As die natuurlike ekologiese sisteme in daardie gebied nie nadelig beïnvloed word nie.

13.11 Tot op hede is ondergenoemde diere en gebiede as "Spesiaal Beskermde Spesies" en "Spesiaal Beskermde Gebiede" verklaar:

(a) (i) Alle spesies van die genus Arctocephalus, Pelsrobbe.

(ii) Ommatophoca rossi, Rossrob.

(iii) Mirounga leonina, Olifantrob.

(b) (i) Taylorbroeiplek, Mac Robertsonland, 67° 26'S, 60° 50'O.

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(ii) Broei-eilande, Holmebaai.
67° 37'S, 62° 33'O.

(iii) Ardery- en Odberteiland, Buddkus.
66° 22'S, 110° 28'O, 66°22'S, 110° 33'O.

(iv) Sabrina-eiland, Balleryeilande
66° 54'S, 163° 20'O.

(v) Beauforteiland, Rossee
76° 58'S, 167° 03'O.

(vi) Kaap Crozier, Rosseiland
77° 32'S, 169° 19'O.

(vii) Kaap Hallett, Victorialand
72° 18'S, 170° 19'O.

(viii) Dioneilande, Margueritebaai, Antarktiese Skiereiland.
67° 52'S, 68° 43'W.

(ix) Greeneiland, Berthelooteilande, Antarktiese Skiereiland.
65° 19'S, 64° 10'W.

(x) Byersskiereiland, Livingstoneiland, Suid-Shetlandeilande
62° 38'S, 61° 05'W.

(xi) Kaap Shirreff, Livingstoneiland, Suid-Shetlandeilande
62° 28'S, 60° 48'W.

(xii) Fildesskiereiland, Koning George-eiland, Suid-Shetlandeilande
62°11'S, 58° 52'W.

(xiii) Moe-eiland, Suid-Orkneyeilande
60° 45'S, 45° 41'W.

(xiv) Lyncheiland
60° 40'S, 45° 38'W.

(xv) Suid-Powelleiland en aangrensende eilande, Suid-Orkneyeilande
60° 45'S, 45° 02'W.

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13.12 Die maatreëls wat reeds genoem is, verval in gevalle van uiterste nood waarby die verlies van menselewens betrokke is.

13.13 Wanneer fauna of flora verwyder of gedood word, moet die volgende inligting onverwyld aan die Sekretaris van Vervoer verstrek word :

(a) Plek waar gedood of verwyder (lengte- en breedtegraad).

(b) Spesie, geslag en ouderdom van dier of plant.

(c) Getal gedood of verwyder.

(d) Doel waarvoor verwyder of gedood.

13.14 Indien enige diere gevang en weer vrygelaat word moet bostaande inligting nogtans verstrek word.

13.15 Tydens die Vyfde Raadplegende Vergadering van Antarktiese Verdragslande is daar op tussentydse maatreëls vir die beheer van seerobbevangs besluit. Hierdie maatreëls is nog nie formeel goedgekeur nie en word gevolglik in die bylaag opgeneem. Vir die doeleindes van Suid-Afrikaanse ekspedisies word die maatreëls egter as bindend beskou.

Hoofstuk 14

Ontspanning

14.1 Daar is ontspanningsfasiliteite beskikbaar, byvoorbeeld tafeltennis, veerpyltjies, speelkaarte, skaak, rolprente, 'n sokkerbal ensomeer. Ekspedisielede word nogtans aangeraai om sover moontlik hierby aan te vul veral wat stokperdjies betref.

14.2 In samewerking met die Afdeling Biblioteekdienste van die Transvaalse Provinsiale Administrasie word 'n boekery by die basis in stand gehou. Ekspedisielede word in Pretoria die geleentheid gebied om boeke van hul eie keuse uit te soek. Die Departement aanvaar aanspreeklikheid daarvoor teenoor die Administrasie. Enige boeke wat mag wegraak sal van die betrokke ekspedisielid verhaal word.

14.3 Die Departement verkies dat geen boeke uitgehou word met die terugkoms op die RSA nie, maar dat alle boeke in Antarktika verpak word vir terugsending. Indien 'n ekspedisielid egter geen ander leesstof het nie, kan hy die Departement per teleks versoek om sekere boeke, waarvan hy die titels moet noem, op die skip uit te hou. Hierdie boeke moet dan in Pretoria aan die Departement teruggehandig word.

14.4 'n Bibliotekaris sal deur die leier aangestel word in oorleg met die Departement. Die leensisteem is baie eenvoudig. Die Bibliotekaris moet slegs toesien dat 'n kaartjie voltooi word vir elke boek wat uitgeneem word. Dit moet die uitleendatum bevat, die naam van die lener en die datum van terugbesorging. Hierdie gegewens moet by terugkeer tot die Departement se beskikking gestel word. Dit word vir navorsing benodig.

14.5 Boeke bly slegs vir die duur van die aflos by die basis. Elke aflosapan neem dus sy eie leesstof saam.

Daar is donkerkamergerieue by die basis beskikbaar. Afdrukpapier en chemikalië moet egter self voorsien word deur ekspedisielede.

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Hoofstuk 15

Terugkeer na die Republiek

15.1 Ekspedisielede moet op die laatste gedurende Oktober laat weet indien hulle enige voorskotte op hulle Desembersalaris verlang. Daar moet duidelik gespesifiseer word of die geld na Antarktika gestuur of in Kaapstad by terugkeer gereed gehou moet word.

15.2 Alle bagasie is onderworpe aan inspeksie deur Doeane en u aandag word weer op die inhoud van hoofstuk 7 gevestig.

15.3 Daar is geen rede vir enigiemand om meer bagasie na Suid-Afrika terug te bring as wat hy na Antarktika geneem het nie.

15.4 Na die aankoms van die RSA in Kaapstad word daar gewoonlik gelcentheid aan ekspedisielede gegee om naasbestaandes te gaan groet. Alle ekspedisielede moet op n datum wat aan hulle bekend gemaak sal word, by die Departement van Vervoer in Pretoria aanmeld aangesien hulle nog sekere toetse en onderhoude moet afhandel. Verlofvorms moet ingehandig word vir die dae waarop verlof geneem is.

15.5 Aandag word weer daarop gevestig dat n verslag van elke ekspedisielid verwag word oor sy werksaamhede te Antarktika. Hierdie verslag moet in Antarktika voltooi word en nie op die skip nie.

15.6 Hierdie verslae moet op die laatste ingehandig word op die dag wanneer die span as geheel in Pretoria ontbind word, tensy die Departement toestemming vooraf aan n ekspedisielid verleen het.

PROTECTIVE CLOTHING: SANAE, EXPEDITION MEMBERS.

NAME: ..... RANK: .....

Item No.		Quantity	
1.	Anaraks, base	2	
2.	Bags, kit, seaman's	3	
3.	Belts, waist, leather	1	
4.	Boots, Bush with inners	1	pair
5.	Inners for Bushboots	2	pairs
6.	Boots, nobben, felt	1	pair
7.	Boots, onitsuka	2	pairs
8.	Caps, fur lined (Velskin)	1	
9.	Caps, ski	1	
10.	Drawers, long (under pants)	4	
11.	Drawers, short (under pants)	4	
12.	Gloves, heavy duty (extended sleeve) Velskin	2	pairs
13.	Gloves, leather	2	pairs
14.	Gloves, woollen	3	pairs
15.	Goggles, snow (amber, green and grey lenses)	2	pairs
16.	Handkerchiefs, Khaki	12	
17.	Haversacks, (Defence type) Borga only	1	
18.	Helmets, balaclava	2	
19.	Housewives, men's	1	
20.	Jerseys, all wool, Norwegian, Icelandic	2	
21.	Knives, clasp	1	
22.	Mittens, chamois (thumb only)	3	pairs
23.	Mittens, woollen (thumb only)	3	pairs
24.	Pyjamas, winter	2	pairs
25.	Scarves, neck squares	1	
26.	Scarves, woollen (Comforters)	2	
27.	Shirts, winter (navy)	3	
28.	Socks, woollen	8	pairs
29.	Stockings, seaboot size 1	6	pairs
30.	Sheepskin ¾ length coat	1	
31.	Slippers, felt	1	pair
32.	Sunglasses	1	pair
33.	Towels, bath	2	
34.	Towels, hand	3	
35.	Trousers, battle dress	2	pairs
36.	Trousers, windproof	2	pairs
37.	Vests, string	3	
38.	Vests, winter, woollen	3	
39.	Overalls, white	1	
40.	Socks (cotton or nylon)	6	

Additional Items for Diesel Mechanics

Gloves, heavy duty, leather	2	pairs
Duffel for gloves heavy duty	2	pairs
Gloves, woollen	2	pairs
Overalls, white	2	pairs
Trousers, battle dress	1	pair
Anarak Base	1	
Trousers windproof	1	pair

Additional Items for Geologist and Geophysigist

Gloves, chamois	1	pair
Gloves, silk	2	pairs
Mittens, chamois	1	pair

N.B. Abovementioned items remain the property of the Expedition Members.


MAP 1
ARGENTINA
CHILE
FALKLAND IS.
SOUTH GEORGIA
Grytviken (BRITAIN)
Gough I. (S. AFRICA)
SOUTH ORKNEY IS.
Signy I. (BRITAIN)
Orcadas (ARGENTINA)
SOUTH SANDWICH IS.
SOUTH SHETLAND IS.
GRAHAM LAND 12 STATIONS, SEE MAP 2
Antarctic Peninsula
ALEXANDER I.
PALMER LAND
WEDDELL SEA
Halley Bay (BRITAIN)
Sanae (S. AFRICA)
FILCHNER ICE SHELF
COATS LAND
General Belgrano (ARGENTINA)
ELLSWORTH LAND
Almirante Brown (ARGENTINA)
Novolazarevskaya (U.S.S.R.)
Lesser Antarctica
DRONNING MAUD LAND
Roi Baudouin (BELGIUM, NETHERLANDS)
'Byrd' (U.S.A.)
BYRD LAND
SOUTH POLE
'Amundsen-Scott' (U.S.A.)
Greater Antarctica
'Plateau Station' (U.S.A.)
Syowa (JAPAN)
Molodezhnaya (U.S.S.R.)
ROSS ICE SHELF
ROSS SEA
TRANS-ANTARCTIC MOUNTAINS
ENDERBY LAND
KEMP LAND
MAC ROBERTSON LAND
'McMurdo' (U.S.A.)
'Scott Base' (NEW ZEALAND)
Mawson (AUSTRALIA)
'Vostok' (U.S.S.R.)
VICTORIA LAND
GEORGE V LAND
PRINCESS ELIZABETH LAND
WILHELM II LAND
QUEEN MARY LAND
WILKES LAND
Mirny (U.S.S.R.)
BALLENY IS.
TERRE ADELIE
'Dumont d'Urville' (FRANCE)
Wilkes (AUSTRALIA)
McDONALD IS.
SOUTHERN OCEAN
Antarctic Circle
THE ANTARCTIC
0 200 400 600 MILES
0 400 800 KILOMETRES
Stations shown are those in use during the Antarctic winter 1966

Antarctic Animals and Plants

Emperor penguin rookery in November.

The animals most visible in the Antarctic are birds, seals, and whales. Whales are often seen from shipboard, and birds and seals may be found on shore as well as in the water.

Penguins and Flying Birds

Over 40 species of birds build their nests and raise their young south of the Antarctic Convergence, but only 12 of these live on the Antarctic Continent. The best-known birds are the penguins, seven species of which are found in the Antarctic. (Ten other species of penguins inhabit lands outside the Antarctic, but all live in the Southern Hemisphere.)

Penguins, no matter where they live, cannot fly. On land, they usually walk erect and waddle along, looking like a cartoonist's version of a man returning from a formal dinner. Where there is ice or snow, they can flop on their stomachs and propel themselves rapidly with their feet and flippers. They are social birds and live in large colonies, termed rookeries, where thousands of these chattering birds seem to be in constant motion.

Penguins live on the bounty of the sea, feeding on fish, krill (a shrimp-like shellfish), and other sea life. They use their flippers to swim as other birds use their wings to fly. Penguins are as graceful in the water as they are clumsy on land. Because an adult penguin has no enemy outside the water, he sleeps when and where he wishes. Usually he sleeps standing up, simply resting his head on his shoulder, but he may tuck his head under his flipper or even lie down.

The two most southern species of penguins are the emperor and the Adélie. The emperor is the larger bird; an average adult stands about three feet tall and weighs about 60 pounds. Emperors "nest" on sea ice that is attached to the land. In the autumn, a single egg is laid. The adults keep the egg warm by carrying it about on their feet and draping a roll of their stomach fat over it. The young chicks are thus hatched and raised during the dark, cold antarctic winter, in temperatures as low as 50, 60, or even 70 degrees below zero. Until they are big enough to walk about alone, the chicks, like the eggs, are carried on an adult's feet. When the chicks are able to feed themselves, the colonies break up and the emperor penguins move northward where the ice pack is breaking up and food is easier to get.

Adélie penguins are much smaller. When full size, they are about 18 inches high and weigh about 14 pounds. Because they are smaller than the emperors, their chicks do not take as long to grow. For that reason, Adélies can lay their eggs in the spring and raise their young during the antarctic summer. Unlike the emperors, who gather on the ice to raise their young, the Adélies seek bare ground and make little piles of pebbles for nests. When autumn comes, the chicks are big enough to take care of themselves and follow the adults out to sea. During the winter, Adélie penguins stay near the edge of the pack ice so that they will have plenty to eat.

Compared with the emperors, the Adélies are much livelier and more interesting to watch. Since penguins have lived in the Antarctic for thousands of years and man has come there only recently, these birds are interested in the newcomer and have not yet learned to fear him. Adélies, in particular, are very curious and frequently come close to camps, ships, and groups of men to see what is going on. They are, however, afraid of loud noises, especially the sound of airplanes and helicopters flying overhead. The pilots of aircraft have therefore been instructed not to fly over the rookeries. Other activities that could interfere with the penguins' normal life have also been prohibited: in too many parts of the world, once great numbers of birds and animals have disappeared. An effort is being made to prevent that happening in Antarctica.

An Adélie penguin is faithful to its mate. The pair return to the same nest to deposit two eggs.

Emperor penguins, though drab as chicks, develop a regal orange necklace.

This chinstrap penguin shares his island perch with blue-eyed shags, a kind of cormorant.

Because penguins feed from the sea and cannot fly, they remain close to shore. Flying birds are not so restricted, and some species nest inland. Small colonies of snow petrels, a beautiful white bird, and of skuas, a bird of prey, have been found 6,000 feet up in the mountains and over 150 miles from the coast. An occasional skua has even been seen flying far inland over the polar plateau. All antarctic birds, except the emperor penguin, migrate northward during the winter when the sea freezes over.

The skua is a scavenger that relishes penguin eggs.

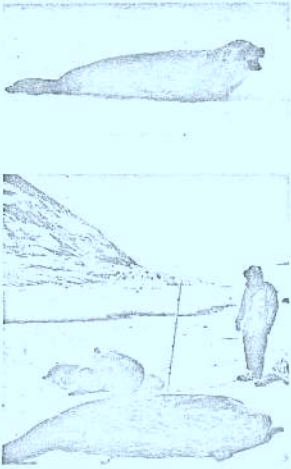
Seals and Whales

Wandering through the ice pack, penguins frequently encounter seals, six species of which breed in the Antarctic. The Ross and Weddell seals are named for antarctic explorers; the leopard seal has spots, and the elephant seal is a large animal with an inflatable snout, but the crabeater acts contrary to its name—it feeds mostly on red krill. Elephant seals are still hunted occasionally for oil, but the taking of fur seals has stopped. In the early 19th century the skins of fur seals brought high prices, especially in China, and the search among the offshore islands for fur seals played an important part in the early history of antarctic exploration. In the years between 1820 and 1830, greedy sealers nearly hunted the southern fur seal out of existence. A few survived, and recently their number has been increasing. They are now protected by international agreement.

Like the fur seal, the elephant seal is an island-dweller. Of the four other species, three live primarily in the ice pack and are not easy to study. The Ross and crabeater seals are rarely seen outside the pack, but the leopard seal ranges more widely. The Weddell seal, the most numerous species, lives close to shore where he can be observed by men at antarctic stations. He has many remarkable characteristics. For example, he has been known to dive through a hole in the ice to depths approaching 2,000 feet and to remain under water up to 40 minutes. He possesses some sort of navigating system that allows him to return to the hole even in the dark. From the depths of the water, he has brought up fish that would otherwise be unknown to man.

Except for the crabeater, seals eat fish, although the leopard seal adds penguins and other seals to his

The vicious leopard seal (above) and the crabeater (below) both dwell in the pack ice, though their diets are very different.



Weddell seal family is viewed by scientist curious about their diving ability.

diet. It is the search for food that causes him to range rather widely. Like other antarctic seals, individual leopard seals will occasionally be spotted north of the Antarctic Convergence, but as species, the seals are not migratory.

Whales, on the other hand, regularly leave the Antarctic for tropical waters during the winter. Of the large number of species that penetrate antarctic waters during the summer, several are still hunted for their oil, and today this activity constitutes the only antarctic industry.

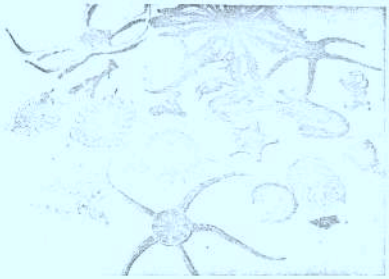
The different species of whales vary greatly in size. The blue whale is the largest animal that has ever inhabited the Earth; its size exceeds that of the largest prehistoric dinosaurs. An adult may be over 90 feet in length and may weigh as much as 150 tons. Most whales have no teeth. They feed by filtering seawater through a giant strainer that hangs from the roof of their mouths. Made of a horny substance called whalebone, this strainer extracts huge quantities of minute sea life from the water.

There are, however, toothed whales. This family includes the dolphins and porpoises. A number of toothed whales live in antarctic waters. The best known is the killer whale, who gets his name from his savage nature. Killer whales feed largely on seals, but they hunt in packs and will sometimes attack blue whales. They are tremendously powerful and have been known to charge from beneath the pack and break through three feet of ice to dump a seal into the water. A photographer on one antarctic expedition had the ice broken near where he was standing, but there is no authenticated instance of a killer whale attacking men in the water.

This abundance of life in and near the seas depends on the movement of large masses of water that bring minerals up from the ocean bottom. These minerals and the light from the sun nourish millions upon millions of small floating plants, called phytoplankton, on which animals may feed. The most widespread of the phytoplankton in antarctic waters are diatoms. These one-celled plants with "glassy" walls can even grow on the underside of the ice in such numbers as to stain it brown. Antarctic waters are also rich in animal plankton (zooplankton), which are fed upon by larger creatures, including the giant blue whale. Thus, these small plants and animals—often as part of a long and complicated food chain—link the ocean depths and the distant sun to other life in and around antarctic waters. It is a long way from the sun to the sea and from diatoms to penguins and seals, but the connections exist.

Life Ashore

While there is a great deal of life in the waters around Antarctica, there is very little on the continent itself. Cold and dry, Antarctica is extremely inhospitable to land animals and plants, and no large animals live on the continent. (As we have seen, the seals and birds live from the sea.) Only on the more northerly islands have a few land-dwelling mammals—



Life in the Weddell Sea includes (top row) the familiar brittle stars (l. and r.), sea cucumber, and a feather star. The spiny ball to the left of the starfish (center) is a sea urchin. Also caught by the 1,000-foot dredge were shrimp and many-legged isopods (two at l., another at r.), which are related to pillbugs. The animal at lower left, a hydroid, is often mistaken for seaweed.

introduced by man—been able to survive. Rats and reindeer, for example, are found on South Georgia, and farm animals and pets have adapted to life on the Kerguelens with varying degrees of success. True land animals do exist on the continent, but they are very small. Some are insects and some belong to the other families of small creatures. The largest is a wingless fly; others are so tiny that they can be seen only through a microscope. They are found in areas that are free of snow and ice for part of the year. There the summer sun warms the rocks and melts the snow, providing moisture. Meltwater ponds and the soil also contain microorganisms. A few terrestrial species have been able to maintain themselves within 400 miles of the South Pole, and insects—or one of their relatives—may be the southernmost of all land animals. For food they eat the primitive plants that grow in the area—and sometimes one another.

Because animals cannot exist without plants, which have the ability to trap the energy of the sun, we might expect to find plants further south than animals. This is indeed the case: some simple plants grow within 300 miles of the South Pole. The most common varieties in Antarctica are lichens and mosses, both of which can be quite colorful. The only flowering plants, mostly grasses, are found on the Antarctic Peninsula and on the islands. No trees are found anywhere within the Antarctic Convergence.

The pattern of life in the Antarctic is very different from that in the Arctic. In addition to larger plants, seals, whales, and seabirds, the Arctic also has four-footed mammals such as polar bears, arctic foxes, hares, and caribou. A million human beings live north of the Arctic Circle, while Antarctica has no natives. The reason for this difference is that the Antarctic is colder and drier than the Arctic and is separated from other inhabited areas by long stretches of ocean. Yet, starting in 1898, a few men have ventured to live there the year around. Ever since 1955, several thousand have made the trip each summer, and each winter more than 600 have remained to brave the cold, the darkness, the snow, and the winds.

What Men Do In Antarctica

Army UH-1 helicopter at field camp in "Laboratory Antarctica."

Men now go to the Antarctic primarily to study the Earth, the space around it, and the life upon it. The fur seals that once attracted men to the area are no longer worth hunting. Whaling, while still carried on, is a declining industry. Although more than 200 minerals have been found in Antarctica, none can be profitably mined. Today, the only activity sufficiently rewarding to draw men toward this great white continent is scientific inquiry.

Not all the people who go there, however, are engaged in scientific pursuits. Those who conduct the scientific studies must be transported, fed, clothed, and housed. If they were to do all these things for themselves, scientists would have very little time for anything else. Members of an antarctic expedition may therefore be divided into two categories: first, there are the scientists, a group which includes the technicians who maintain and operate scientific equipment; second, there are the support personnel, a category that includes a wide variety of specialists to provide the services required to keep an expedition going. It is common for the support personnel to outnumber the scientists.

Navy Support for Science

The distinction between science and support is quite clear in the way the United States has organized its antarctic activities. The scientific effort, called the United States Antarctic Research Program (USARP), is managed and paid for by the National Science Foundation. The scientists are civilians from universities, research institutes, and government agencies. The support personnel are military, principally from the Navy, which has been assigned the responsibility of supporting the United States program in Antarctica. The Navy has the authority to request assistance from the other military services and has occasionally found it necessary to employ civilian experts as well.

Navy support of the antarctic program begins in the United States, where equipment, supplies, and personnel are first gathered together. In general, equipment and supplies leave for Antarctica by ship, while people are flown. The principal United States operating area in the Antarctic lies south of New Zealand, and it is customary to stage through that country. (An exception is Palmer Station, which is located below South America and is supplied by ship from the United States via South American ports). The advance headquarters of the Navy's support organization is maintained at Christchurch, on New Zealand's South Island.

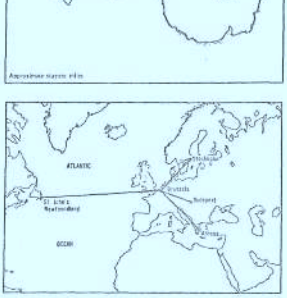
McMurdo Station, the primary United States supply base in Antarctica, is 2,500 miles south of Christchurch. To McMurdo come ships with fuel, supplies,

Three-hour flights to supply Byrd Station have replaced week-long tractor treks.

and equipment, and Navy and Air Force transport aircraft with people, mail, fresh foods, and high-priority cargo. Incoming material is sorted, and some of it is prepared for further shipment inland. Formerly, the United States shipped much of its material from the coast to interior stations on sleds drawn by tracked vehicles. Other nations still do so, but since 1959, the United States has sent all supplies inland by aircraft.

Since 1957, the number of year-round stations operated by the United States has varied between seven and four. In 1967, there were five: McMurdo, at 77°51'S., 166°37'E.; Amundsen-Scott South Pole Station at the Geographic South Pole; Byrd Station at 80°01'S., 119°32'W.; Plateau Station at 79°15'S., 40°30'E.; and Palmer Station at 64°46'S., 64°05'W. Another station, Hallett, was occupied full time from 1957 to 1965, after which it was manned only in the summer. Its location beneath the air route from New Zealand to McMurdo Station makes it a good place to take weather observations for flight forecasting. During each summer's air operations, the Navy also maintains a small weather station on the Ross Ice Shelf. In addition, temporary camps are established for scientists to work at during the summer months, and small field parties are frequently moved from place to place.

Distances in the Antarctic are great. For example, from McMurdo to the South Pole is about 800 miles, to Byrd about 900 miles, and to Plateau about 1,350 miles. If the logistic supply line south from New Zealand through McMurdo to the inland stations were laid out on the more familiar map of the North Atlantic area, the first leg from Christchurch to McMurdo would be approximately equal to that of a transatlantic flight from St. John's, Newfoundland, to Brussels, Belgium. The South Pole lies as far beyond McMurdo as Budapest, Hungary, is beyond Brussels; the distance from McMurdo to Byrd Station is about that from Brussels to Stockholm, Sweden; and to go to Plateau Station would require the equivalent of a flight from Brussels to Athens, Greece.



Everything that men need for living and working has to be carried over these long distances. Stations have to be built and maintained, and their inhabitants require food to eat, fuel to keep them warm, and doctors and drugs to heal them. Fuel, lubricating oil, and spare parts have to be on hand for the many types of vehicles used in Antarctica. Aircraft must be serviced and maintained. Parties in the field must be resupplied and moved from one place to another. To keep all these activities going, extensive radio communications are necessary.

To provide all this support, the U. S. Naval Support Force, Antarctica was established as part of the Atlantic Fleet on February 1, 1955. Commanded by a rear admiral, the Support Force has developed the highly complex and effective logistic system that now exists. Also established in early 1955 was Air Development Squadron Six. This Navy aviation unit has played a significant part in every *Deep Freeze* operation, and its achievements have revolutionized the art of antarctic exploration.

Each season, about 800 persons arrive in Antarctica to carry out the many support functions. The 9 or 10 Navy and Coast Guard ships used in each year's operations have on board about 1,500 officers and men. All told, there are about 2,300 U. S. support personnel in the Antarctic during the summer, almost all of them military. When the 200 scientific personnel are added to this figure, it gives a total of 2,500 people engaged in the United States antarctic program. Between 250 and 275 members of the summer group, including approximately 35 scientists, remain at the stations over the winter.

Walt Disney designed this emblem to symbolize the mariner-aviator-seabee team that supports antarctic science.

Broad Scientific Program

The United States scientific program in the Antarctic is coordinated with the programs of the other countries active in the area. This is done through the International Scientific Committee on Antarctic Research, usually called SCAR. At SCAR meetings, the broad objectives of scientific investigation in the Antarctic are determined. Within this framework are developed the various national programs, including that of the United States. Full cooperation by all concerned has been an outstanding feature of antarctic operations.

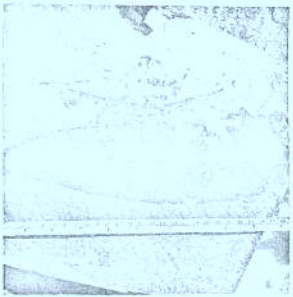
In the United States, research projects are proposed by individual scientists. After approval by the scientist's university, institute, or government agency, the National Science Foundation reviews the proposal to see if it is scientifically sound, will contribute to the objectives of SCAR, and can be supported by the Navy. When a project is approved, a grant of money is made to the scientist's organization.

The scientific projects are often so specialized that it is difficult to see how they fit into the broad objectives recommended by SCAR. In 1966, for example, the Navy flew a scientist and two assistants to a remote antarctic mountain range to collect the fossil remains of conchostracans, freshwater shellfish that lived during the Paleozoic Era, 250 to 550 million years ago. This project may seem insignificant, but the results could shed light on two great scientific topics. One, of course, is the evolution of life. The other is the past relationship of the continents to one another. Because these animals lived in fresh water, they could not move across the sea. Therefore, if the fossils found in Antarctica resemble those from South America and South Africa, there will be another piece of evidence that the southern continents were connected to each other millions of years ago.

Studying the Continent's Past

Many scientists believe that the Indian Peninsula and the continents of the Southern Hemisphere—Australia, South America, Africa, and Antarctica—once formed a single great land mass called Gondwanaland. They think that at some far-distant time Gondwanaland broke up, and the pieces drifted across the surface of the Earth to their present positions. To test this theory of continental drift, scientists have investigated many things besides conchostracans. For example, they have studied ancient glacial gravels, called tillites, to see whether outcrops in Antarctica resemble those in Australia, South Africa, and the Falkland Islands.

Not all scientists accept the theory of continental drift, even though there is considerable evidence in its favor. All, however, recognize that Antarctica once



Fossil leaves and coal are records of Antarctica's warmer past.

had a very different climate than it does now. A variety of plant fossils, including giant ferns and the trunks of trees, have been found. There are also great quantities of coal, which is formed from plants. It would appear that as late as 100 million years ago Antarctica was covered by an extensive rain forest.

To geologists, the Antarctic Continent is divided into two parts by one of the world's great mountain chains, the Transantarctic Mountains. The line between East Antarctica and West Antarctica corresponds roughly, though not exactly, to the division between the Eastern and Western Hemispheres. The larger and older of the two parts is East Antarctica; it is basically a crystalline shield formed more than 600 million years ago, comparable to the crystalline shield that covers much of the interior of Canada. Such areas usually are rich in minerals, but little is known about East Antarctica because most of it is covered with ice, and even the ice-free portion has not been completely studied. The greater part of the shield lies above sea level and would appear as land if the ice should melt.

West Antarctica is quite different. It is made up of a series of mountain ranges of comparatively recent origin. Among the peaks visible above the ice cap are many of a volcanic nature. At least two are still active: Mt. Erebus, which towers more than 12,000 feet above McMurdo Station, and Mt. Melbourne, on the coast of Victoria Land, which was discovered to be active in January 1967. One part of West Antarctica, the Antarctic Peninsula, extends northward to within 600 miles of the tip of South America. Geologically, this peninsula resembles the Andes Mountains, of which it is probably a continuation. If the ice were to melt, West Antarctica would be found to

Only 4.5 percent of Antarctica—regions near the coasts or in the mountains—is not covered by snow and ice.

have many islands and deep fjords. Byrd Station, for example, is 5,000 feet above sea level, but it sits on some 8,000 feet of ice. Some scientists have suggested that the Ross and Weddell Seas are linked by an ice-filled strait, but no such connection has been discovered.

There are ways to find out what lies under the ice. Although the application of these techniques to all of Antarctica will take a long time, the information obtained so far has contained surprises. First, it was found that much more ice exists in the Antarctic than was originally believed. Second, that the ice does not lie evenly over the continent—disproving the earlier assumption that because the ice surface rose gently toward the middle of the continent the land below did also.

Even if all under-ice topography were known, it would still be impossible to predict what Antarctica would look like if the ice should melt. It is true that if the tremendous weight of the ice cap were removed, the continental surface beneath would rise, probably by 2,500 feet, but it would not do so uniformly. What is more, some of the land would still be hidden because the melting of the ice would raise the level of the seas. No one knows exactly how much the waters would rise, but 200 feet is a common estimate.

Information in the Ice

The study of the ice itself is the work of glaciologists. Antarctica is a wonderful laboratory for them; it contains about 95 percent of the world's permanent ice. As late as 10,000 years ago—during the most recent of the ice ages—much of North America, Europe, and Asia was covered by a great ice sheet. Today, only traces remain on Greenland and other arctic islands, but glaciologists can still see the ice age in Antarctica and study its mechanics. Among other things, they wish to know how much ice there is and whether it is increasing or decreasing. They now estimate that there are about 7 million cubic miles of ice in Antarctica, but it will take many years to determine whether the volume is changing. The information gathered up to now suggests that the situation is more complicated than a simple decrease or increase; apparently there are two major ice sheets, one in East Antarctica and another in West Antarctica, and one may be shrinking while the other is growing.

Clues About the Weather

Glaciologists call tell how much snow has accumulated each year because annual layers can be distinguished long after the snow has turned to ice. Like the growth rings in a tree trunk, these layers are a record of information of the climate in the past. The ice also holds other information. Falling snow catches small particles—specks from outer space or dust from volcanic explosions or the debris of man's own activities, such as the fallout from atomic explosions or the lead from automobile exhaust. All these are preserved in the layers of compacted snow and ice. In some cases, the ice can be used as a shortcut in collecting temperature information. Because seasonal changes in the surface temperature affect only the upper 25-35 feet of the continental ice, the temperature below that depth is equal to the average annual temperature. Drilling one hole can thus take the place of recording daily surface temperatures at that location for a whole year. Obviously, much that is worth knowing can be learned from the ice.

As a record of climate, ice cores are of great interest to meteorologists, the men who study and forecast the weather. Accurate forecasting depends upon a vast knowledge of how weather is made. Basic to this

Scientists brought from nearby McMurdo in UH-34 helicopters have tunneled into Meserve Glacier to answer riddle of rare "dry valleys."

Ice core is weighed fresh from auger. Cores yield information to glaciologists, physicists, and meteorologists.

process is the tremendous energy of the sun. In the tropical and temperate zones, the sun's heat withdraws water from the sea and ground and carries it aloft in the form of vapor. As moisture-laden air moves toward the poles, it cools, causing the water vapor to condense and fall as rain or snow. Similarly, as the air itself gradually gives up its heat, it drops down to flow back toward the Tropics. For this reason, the polar regions are often called heat sinks. This exchange of energy is like a giant engine that moves the air and causes the weather. Actually, the process is very complicated and is affected by all sorts of factors such as the rotation of the Earth and the existence of land masses that deflect the flow, but both polar areas play a very important part by influencing circulation patterns over the entire globe.

Magnets in Space

The Earth's atmosphere extends outward hundreds of miles, gradually becoming so thin that it cannot (at about 20,000 feet) support human life. The upper reaches of the atmosphere, however, are not a complete void. From the sun and outer space arrives a constant stream of charged particles carrying tremendous energy. Travelling at speeds of 250 miles a second, the solar wind, as the particles emanating from the sun are called, seeks to spread the sun's magnetic field through the space between the planets. When it comes into contact with the Earth's magnetic field, a mighty struggle goes on for domination. Visible evidence of this conflict exists in the auroras, the Northern and Southern Lights of the polar regions, which are occasionally seen in the temperate zones.

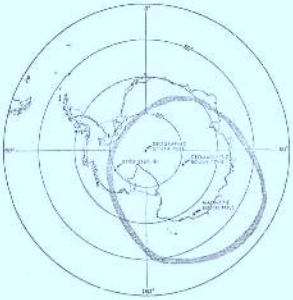
Auroras occur more often in the polar regions because the Earth is like a giant bar magnet with its ends, or poles, in the Arctic and the Antarctic. Solar particles caught in the Earth's magnetic field are drawn along the lines of force that connect the ends of the magnet. In both polar regions, where these lines come closer together and pass through the atmosphere, the solar particles reach a level where they may collide with air molecules. The collision releases some of the particles' energy as light, forming an aurora.

Scientists have calculated where auroras may be seen most often. These zones, one in the Arctic and another in the Antarctic, are roughly ovals around a line connecting the magnetic and geomagnetic poles in each hemisphere. Byrd Station, in the antarctic auroral zone, is the site of many studies in upper atmosphere physics. In such research, it is important to take simultaneous observations at conjugate points—places that are linked together by the same line of magnetic force. Byrd Station is almost conjugate to Great Whale River in Canada, and the upper atmosphere investigations at these two locations are part of a common program.

Aurora seen from Plateau Station during the austral winter.

This field of research, which has expanded quickly since 1957, has already had important results for the outer space program and for radio communications. The particles trapped by the Earth's magnetic field form a blanket in the region of the upper atmosphere called the ionosphere. The fact that radio waves of certain wavelengths bounce back from the ionosphere makes possible long-distance radio communications. Clearly, anything that disturbs the ionosphere affects our ability to communicate. An extreme disturbance can even result in a worldwide communications blackout, as happened in February 1958.

The Different Poles



The Earth has three pairs of poles. One member of each pair is in the Antarctic. While one pair is produced by the Earth's daily rotation, the others relate to geomagnetism—the natural magnetism of the Earth and its atmosphere.

THE GEOGRAPHIC POLES, which are often referred to as simply the South Pole and the North Pole, are determined by the daily rotation of our planet. They are the two points where the axis of rotation passes through the surface of the Earth. This axis is a line through the center of our planet, around which it spins like a perpetual top. Because the Earth continues to rotate around the same axis, the geographic poles do not move. (Actually, scientists believe that the geographic poles have moved very slowly throughout geological time, but the movement is too little to measure in the relatively short history of man.) Their constant position allows us to use these points as the basis of our system of direction and location. An imaginary circle halfway between these poles, the Equator, divides the world into Northern and Southern Hemispheres. Circles parallel to the Equator are the lines of latitude, and lines connecting the geographic poles—longitude—complete the system.

THE GEOMAGNETIC POLES are used by scientists to describe the Earth's basic magnetic field. Most of the characteristics of this field could be created if a powerful bar magnet were buried in the center of the Earth with its axis tilted at about 11.5° to the axis of rotation. The geomagnetic poles are the two points where a continuation of the axis of this theoretical magnet would cut the Earth's surface: approximately 78°30'N., 69°W. and 78°30'S., 111°E. —about 800 miles from the corresponding geographic poles. Because these points are part of an explanatory theory, they are imaginary and do not move.

Scientists interested in geomagnetism use them as the basis of a system of *geomagnetic* latitude and longitude: the Geomagnetic Equator is inclined 11.5° to the Geographic Equator, and the zero meridian in geomagnetic longitude is the one passing through both of the geomagnetic poles and the *Geographic* South Pole.

THE MAGNETIC POLES (sometimes called the magnetic dip poles) are real, not theoretical points. They are the places you would arrive at if you followed, north and south, the path indicated by a compass needle. At these points, one end of your compass needle would dip straight down, showing the convergence there of the magnetic lines of force.

If the Earth's actual magnetic field were exactly the same as that which the scientists' hypothetical magnet would produce, your compass needle would be horizontal at the Geomagnetic Equator and would lead you to the North and South Geomagnetic Poles, where it would be vertical. This is not so. Other, local magnetic fields in the Earth make the real magnetic field near the surface different from the theoretical field. So your compass leads you to the magnetic dip poles at about 75°N., 101°W., in the islands of northern Canada, and 70°S., 148°E., on the coast of Antarctica—roughly 675 miles from the corresponding geomagnetic poles. (The search for the exact location of the magnetic poles was an important factor in early polar exploration.) A straight line between the magnetic poles does *not* pass through the center of the Earth. They also differ in another way from the geographic and geomagnetic poles: they move quite a bit. Recently they have been drifting northwestward at about five miles a year.

The richness of life in the antarctic seas that now fascinates the marine biologist may also contribute to man's food supply in the future.

Studies of the Seas

Just as the air from Antarctica plays an important part in making the world's weather, the cold water flowing northward affects ocean currents as far away as the Northern Hemisphere. Oceanographers study these currents and the tides, and they analyze the mineral content of the waters. Samples from the ocean floor reveal much about the sea life of the past, and the rocks and stones are of interest to the geologist because many have been dropped by icebergs which originally picked them up by scraping over the land as part of the great ice sheet.

Whether on land or in the seas, antarctic life is a subject for biologists. The first task of the antarctic biologist has been to identify the species of plants and animals, from bacteria to whales; although new species—particularly of insects and microscopic organisms—are still being found, this task is nearing completion. Now biologists are turning their attention to how plants and animals adapt to the cold, rigorous climate. Adaptation, of course, is a basic process of evolution, and the Antarctic is a good place to study the process because the environment, though rugged, is also rather simple. With fewer factors to be studied, the whole process becomes easier to understand. A third and related subject of biological study is the interrelation of the species of plants and animals to one another and to their environment. Again, biologists are aided by a simplifying factor. In the Antarctic, there frequently are many individuals of a particular species—emperor penguins, for example—but the number of species, whether of plants or animals, is small. The number of interactions is therefore less than in other areas. Finally, the Antarctic has been less affected by man's activities than the rest of the world, and nature may be observed more nearly in its original state.

While man is the most destructive of all animals, he is also the most curious and thoughtful. Fridtjof Nansen, the great Norwegian explorer of the Arctic, once tried to explain what drove him and others to risk their lives in hostile polar regions. He wrote:

Man wants to know,
and when he ceases to do so,
he is no longer man.

With instruments like this airglow meter, man probes the atmosphere above Antarctica.

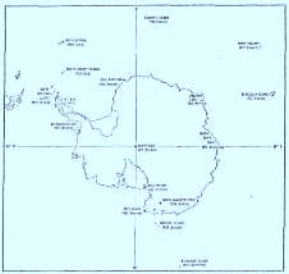
The Age of Discovery

The long voyage of Lt. Charles Wilkes in the mid-19th century proved Antarctica a continent.

Men's minds were haunted by the idea of a great southern continent for many centuries before Antarctica was discovered. The Polynesians, including the Maoris of New Zealand, had legends about a white land to the south of them—their big canoes apparently had sailed south until stopped by ice. Earlier, the ancient Greeks believed that a great southern continent must exist. It was needed, they thought, to balance the land masses of the Northern Hemisphere. Although none of them ever saw it, they gave the region its name: in Greek, Antarctic means "the opposite of the Arctic."

Preludes to Discovery

Many famous voyages were made to find the fabled southern continent, for men imagined it to be populated and to contain great riches. The earlier of these explorers instead discovered Australia and many South Pacific islands. It is possible that a number of ships blown off course by the great storms around Cape Horn may have glimpsed some of the antarctic islands, but the first documented discovery of land within the Antarctic Convergence was not made until the 18th century: on January 1, 1739, a French expedition under Bouvet de Lozier sighted a snow-covered, fog-shrouded island in the South Atlantic, now called Bouvet Island. On February 12, 1772, another Frenchman, Yves de Kerguelen-Tremarec, discovered the Kerguelen Islands in the southern Indian Ocean. In between came another discovery. A passenger on a Spanish merchant ship reported sailing around a large island east of Cape Horn in 1756. It was given the name of San Pedro, but it now appears on the map as South Georgia.



Notable discoveries around and in Antarctica.

Both Bouvet and Kerguelen thought that their discoveries might be part of the great southern continent. Kerguelen was later to revisit the area and determine for himself that he had actually seen islands. Before he did, however, Captain James Cook of the British Navy, one of the most illustrious navigators of all time, brought to an end the dream of an inhabited southern continent. Between 1772 and 1775, he sailed completely around Antarctica. Although he never sighted it, he did penetrate farther south than any man before him, and on January 17, 1773, he became the first man to cross the Antarctic Circle. He encountered great expanses of pack ice and many huge icebergs. This, and the presence of numerous seabirds, led him to believe that an ice-defended land lay to the south.

Even if Cook did not see Antarctica, he did sight the South Sandwich Islands and rediscovered South Georgia. On the beaches of the latter he spied fur seals. This news was of great interest to hundreds of

adventurous American and British seal hunters. The demand for sealskins was very great in those days, and as the number of seals on known beaches decreased, the hunters sailed further southward looking for new beaches and more seals. Cook's report was like a magnet drawing them onward.

Discovery of a Continent

It seems probable that these sealers were the first people to see Antarctica. The sealers, however, frequently tried to keep their discoveries secret to prevent others from knowing of new seal colonies. Also, they did not keep very good records—and many of those they did keep have been lost.

We are fairly certain, however, that on November 17, 1820, Captain Nathaniel B. Palmer, of Stonington, Connecticut, sighted the continent near the tip of the Antarctic Peninsula. The first known landing on the continent was made a few months later. On February 7, 1821, Captain John Davis, of New Haven, Connecticut, sent a boatload of men to look for seals on the shore of what is now called Hughes Bay. Captain Davis' logbook was found only a few years ago. It may be that in old houses or in the hands of descendants are other old logbooks, and one of these may contain an earlier date for the first ship to see the Antarctic Continent.

On January 30, 1820, several months before Captain Palmer's sighting, a British ship had sailed through the same area, but the weather was bad. When the air cleared somewhat, those on board saw "land" to the south. This may have been the mainland, or it may have been an island off the coast. No one is quite sure.

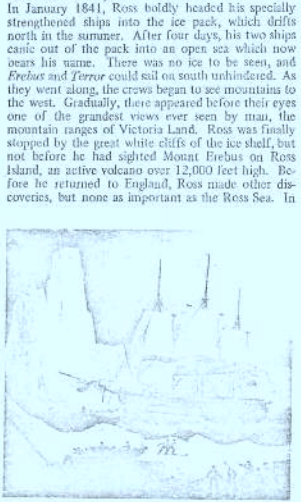
During the same month, two Russian ships were cruising off the opposite side of Antarctica. Their commander was Thaddeus Bellingshausen, an officer in the Russian Navy. Bellingshausen was a cautious man. At times during 1820, he saw what might have been ice-covered land, but it also might have been giant icebergs stuck fast in the pack. Unless he was sure, he would not say. Finally, on January 28, 1821, he saw a rugged, mountainous coast which he named Alexander I Land after the Emperor of Russia. In 1940, United States explorers found that Alexander I Land is really an island separated from the continent by a narrow, ice-filled strait and renamed it Alexander Island.

On February 7, 1821, the day he had sent a boat ashore in Hughes Bay, Captain Davis wrote in his logbook, "I think this Southern Land to be a Continent." He was right, but 19 years passed before enough points along the coast had been seen to be sure. In the years between, United States and British ships made occasional sightings along isolated parts of the continent.

The real proof that Antarctica was a continent came from an expedition of five ships led by Lieutenant Charles Wilkes of the United States Navy. This was the first time the American Government sent its own ships to explore the Antarctic. Departing the United States late in 1838, Wilkes first reached the Antarctic south of Cape Horn early the following year. After skirting the ice pack along a westward course, he sailed to Australia to spend the winter. He returned to the Antarctic, south of Australia, in December 1839. Sailing again in a westerly direction, he sighted land at numerous points over a distance of 1,500 miles. After Wilkes returned, people accepted the existence of a southern continent, Antarctica. Today, a big section of Antarctica appears on our maps as Wilkes Land.

Imagine the surprise on one of Wilkes' ships on January 30, 1840, when—as they felt their way through a sea filled with icebergs—two ships flying the flag of France suddenly loomed up and then disappeared again. It was almost like seeing ghosts in this lonely, out-of-the-way place. Actually, the two ships carried an exploring expedition that had left France in 1837. Their commander was Captain Dumont d'Urville of the French Navy. He, too, discovered parts of Antarctica, and one of them is now called the Adélie Coast, after the name of his wife.

Before he left the southern seas, Lieutenant Wilkes took time to write a letter about his discoveries to a British naval officer, James Clark Ross. Because he knew about the voyages of Wilkes and d'Urville, Ross sailed farther east, to an area south of New Zealand. In January 1841, Ross boldly headed his specially strengthened ships into the ice pack, which drifts north in the summer. After four days, his two ships came out of the pack into an open sea which now bears his name. There was no ice to be seen, and *Erebus* and *Terror* could sail on south unhindered. As they went along, the crews began to see mountains to the west. Gradually, there appeared before their eyes one of the grandest views ever seen by man, the mountain ranges of Victoria Land. Ross was finally stopped by the great white cliffs of the ice shelf, but not before he had sighted Mount Erebus on Ross Island, an active volcano over 12,000 feet high. Before he returned to England, Ross made other discoveries, but none as important as the Ross Sea. In



Sir James Clark Ross' ship "Erebus" in the antarctic ice.

that area, he had sailed as far south as it is possible to go by ship. He had found the best way to reach the heart of the continent and the closest navigable approach to the South Pole.

After Wilkes, d'Urville, and Ross returned to their homelands, men lost interest in antarctic exploration. For 50 years, only occasional efforts were made to learn more about the mysterious white continent, although sealers and whalers from the United States based their operations on islands within the Antarctic Convergence until about 1880.

The Heroic Era

Shortly after 1890, interest in the Antarctic revived, to continue ever since. There seem to be two principal reasons for this: first, scientists were convinced that more must be known about the south polar region if we are to understand the world and the universe better; second, new methods of whaling made it possible to catch and use antarctic whales.

During the winter of 1898, a Belgian exploring expedition under Lieutenant Adrien de Gerlache found its ship frozen fast. All winter long, the *Belgica* drifted with the ice until another summer freed her. Just about the time the ice loosened its grip on the Belgian ship, a British expedition, led by C. E. Borchgrevink, landed at Cape Adare. This landmark is at the western entrance of the Ross Sea. Here, Borchgrevink and his party built a hut. Their ship sailed away to New Zealand and returned to pick them up the following summer.

These two expeditions began what has been called the heroic era of antarctic exploration. Before de Gerlache, no scientific party had spent a winter in the Antarctic. Before Borchgrevink, none had attempted to live on the continent. Previously, men had been limited to what they could see during the summer—and then they had gone ashore only very briefly, if at all. Now it was proved that a base could be set up during the summer and journeys into the interior begun early the following spring. This has remained a principal procedure of antarctic exploration.

During the heroic period, men penetrated the continent and reached the South Pole itself. They faced dangers about which they knew little, with equipment that was frequently inadequate to the task. How to survive was learned by surviving. Above all, these early explorers had courage. From their failures and their successes were learned the techniques of antarctic exploration.

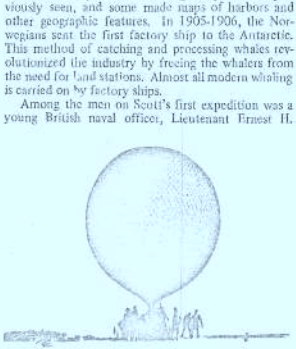
In 1901, German, Swedish, and British expeditions took to the field. All had their exciting times. The Germans' ship, *Gauss*, was frozen in the ice within sight of their goal and drifted with the pack for a year. The Swedes, on the other hand, made shore, but their relief ship, *Antarctic*, was crushed, leaving both the wintering-over party and the ship's company to make out as best they could. Their experiences proved that men could live from what they could find in the Antarctic, though a diet of seal and penguin is somewhat monotonous. They remained in the area until November 1903, when an Argentine naval vessel came to their rescue.

The British National Antarctic Expedition (1901-1904) was commanded by Commander (later Captain) Robert Falcon Scott of the Royal Navy. Because Captain Scott had strong scientific interests, his expedition was one of the most important ever to enter the Antarctic. From his base at Hut Point on McMurdo Sound, many sledging parties set out to explore and observe. One went south over the Ross Ice Shelf for 380 miles. Two others climbed the Victoria Land mountains and reached the polar plateau for the first time. By the time Captain Scott left in 1904, his scientists, together with those of the German and Swedish expeditions, had collected enough information to put antarctic studies on a sound basis.

From 1901, expeditions were in the area nearly every year. Between 1902 and 1904, a Scottish expedition explored the east side of the Antarctic Peninsula and set up a weather station on subantarctic Laurie Island. This station was turned over to the Argentine Government in 1904 and has been maintained ever since. Dr. Jean B. Charcot, a Frenchman, led ship-based parties to the west side of the Antarctic Peninsula on two occasions, 1903-1905 and 1908-1910. During the summer of 1911-1912, Japanese and German expeditions were in the area. The Japanese landed at the eastern end of the Ross Sea, while the Germans, under Wilhelm Filchner, entered the Weddell Sea and discovered the great Filchner Ice Shelf.

Increasing numbers of whalers were also active in the area. Many of them investigated places not previously seen, and some made maps of harbors and other geographic features. In 1905-1906, the Norwegians sent the first factory ship to the Antarctic. This method of catching and processing whales revolutionized the industry by freeing the whalers from the need for land stations. Almost all modern whaling is carried on by factory ships.

Among the men on Scott's first expedition was a young British naval officer, Lieutenant Ernest H.



First man airborne over Antarctica was Captain Scott in 1902. Lt. Shackleton ascended the same day to take the first aerial photograph of Antarctica.

Shackleton. The Antarctic entered his heart, never to be absent until his death. As a leader, Shackleton showed great daring and imagination, combined with a practical sense of just how far to go. He took his first expedition to the Antarctic in 1907. A sledging party, which he led personally, crossed the Ross Ice Shelf, climbed the great glaciers at its head, and reached a point only 113 miles (97 geographic miles) from the South Pole. Other parties climbed Mount Erebus and scaled the Victoria Land plateau, where one of them located the South Magnetic Pole, thus ending a search that had begun 70 years before with the voyages of Wilkes, Ross, and d'Urville.

Triumph and Tragedy

The climax of the heroic period came in 1911 and 1912: the Geographic South Pole was reached. First to arrive there was the great Norwegian explorer, Roald Amundsen. Leaving from the Bay of Whales in October 1911, Amundsen and four companions reached the vicinity of the Pole on December 14 and spent the next three days checking and rechecking their position. Amundsen's journey showed his great skill as an organizer and proved that teams of Eskimo dogs were the best existing means of transport.

On January 17, 1912, about a month after Amundsen, Captain Scott and four other Englishmen stood on the same spot. They had started from McMurdo Sound, considerably further from the Pole than the Bay of Whales. On his ship, *Terra Nova*, Scott had brought Siberian ponies, but these plucky little beasts proved unequal to the task of pulling sleds. For the greater part of the way, the men depended on their own strength, harnessing themselves to their sled. On the return from the Pole, misfortune followed their footsteps. Growing weaker each day from their great exertion and the lack of proper food, they also encountered storms and blizzards. One man died on the trail. Another, sick and feeling that he was too great a burden to the others, walked from the tent into a raging storm to die alone. Captain Scott and his two remaining companions struggled a little further until they were trapped by a blizzard. They died in their tent, a scant 11 miles from the next food depot. They met death as they had faced life: like gallant gentlemen.

Amundsen's tent at the South Pole, the Norwegian flag still flying, was found by Scott's party a month later.

The following spring, a relief party found the tent and collected Captain Scott's papers and diaries. Among other items, it found 30 pounds of rocks, all selected for their scientific interest. Despite cold,

Scott's doomed party on the polar plateau. This picture by Lt. Bowers shows (l. to r.) Evans, Oates, Wilson, and Scott.

In his "den" at Cape Evans, Captain Scott works on his diary entry for October 7, 1911: "...Long and cheerful [telephone] conversations with Hut Point and of course an opportunity for lots exchange of reflections..."

On Wednesday, January 17, 1912, he wrote: "...The Pole. Yes, but under very different circumstances from those expected.... Great God! This is an awful place and terrible enough for us to have laboured to it without the reward of priority.... Now for the run home and a desperate struggle. I wonder if we can do it."

hunger, and weakness, the determined band had carried these valuable specimens to the end. Even in the face of tragedy, Scott's second expedition, like his first, was a triumph for science.

By his emphasis on scientific studies, Scott had done as much as any man to make certain that exploration of the Antarctic would continue. Very little of the continent had been seen, and the forces affecting the weather were little understood. In fact, study of the Antarctic was just beginning.

While Scott and his men were struggling to their unfortunate end, the Australasian Antarctic Expedition under Douglas Mawson had set up two bases south of Mawson's homeland. A distinguished Australian scientist, Mawson was one of the truly great antarctic explorers. On this 1911–1914 expedition, Mawson set up camp along George V Coast at what is perhaps the windiest spot in the world. Winds of 100 miles an hour were frequent, and on one occasion he reported winds of over 200 miles an hour.

Adventurous End of an Era

In the meantime, Shackleton was at work organizing another expedition. He had the great dream of crossing Antarctica from the Weddell Sea to the Ross Sea by way of the South Pole. The main party, led by Shackleton, was to make the journey from the Weddell Sea, and a supporting group—to be based at McMurdo Sound on the Ross Sea—was to lay depots of food and fuel across the 400 miles of the Ross Ice Shelf.

What happened is one of the greatest adventures in the history of exploration. Shackleton's ship, *Endurance*, froze fast in the Weddell Sea and drifted more than 500 miles before she was overcome by the

Shackleton (c.) and his men spent six months in tents on drifting ice floe.

power of the ice and crushed. The crew took to the pack, saving such supplies and equipment as it could, including the small boats. These men lived on the ice from October 1915 to April 1916, continuing to drift northward. Finally, the pack broke up beneath them, and they took to their boats, heading for Elephant Island in the South Shetlands.

After a short rest on Elephant Island, Shackleton set forth again with five companions to sail to South Georgia, where he could get help from the whaling stations. This voyage across 800 miles of the roughest seas in the world is an heroic feat almost without equal among adventures in small boats. As they approached South Georgia, a violent storm blew up, forcing them to land on the opposite side of the island from the whaling stations. Shackleton and two others decided to cross the island to get help. This meant scaling ice-covered mountains that had never before been climbed. In the end, they made it, but there were still three men on the other side of South Georgia and those on Elephant Island to rescue.

Whale catchers picked up the men on South Georgia, but Elephant Island was a more difficult problem. Three times ships were turned back by the ice. Finally, the Chilean vessel *Yelcho*, commanded by Luis Pardo and with Shackleton aboard, reached the island and took the men off. In all these perilous adventures not a man was lost!

The supporting Ross Sea party was not so fortunate. Its ship, *Aurora*, was caught in the ice and drifted away with the pack, carrying a large part of the equipment and supplies with her. Under great difficulties, the 10 men trapped ashore placed the depots. One man died on the trail, and two others disappeared when the sea ice broke up. On January 10, 1917, *Aurora* finally came back to rescue the survivors.

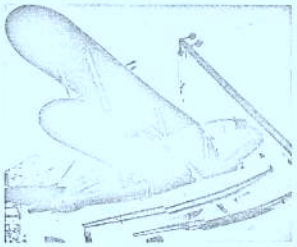
Shackleton returned once more to the region he loved so well. Early in January 1922, his ship reached South Georgia, and there he died of a heart attack. He lies buried in that gateway to the Antarctic. Carefully tended by the rough men of the whaling station, his grave is a shrine to all who pass that way.

Shackleton's death closed the heroic era of antarctic exploration. Although it remains dangerous to penetrate the continent, expeditions and trail parties now have radios to keep in touch with their fellows, and the use of airplanes and tracked vehicles makes speedier rescues possible.

Air Age Arrives

The first airplane flight above the Antarctic Continent was made on November 26, 1928. Aboard the plane was the Australian leader of the Wilkins-Hearst Antarctic Expedition, Sir Hubert Wilkins. The pilot, Carl B. Eielson, was an American with experience in Alaska.

Although he was not the first antarctic aviator, the man who proved the usefulness of the airplane in Antarctica was Rear Admiral Richard E. Byrd of the United States. In fact, it may be said that Admiral Byrd, more than any other explorer, brought modern machines and methods of communications to the area.



Loading Admiral Byrd's Condor, "Floyd Bennett," in New Zealand for his first expedition.

Before leading his first expedition to the Antarctic, Byrd had already made a distinguished career in aviation. In 1926, he had been the first man to fly over the North Pole. He also had been prominent in developing the instruments which made such flights possible. Byrd's great skill as a navigator was only one of his outstanding qualities. In action, he combined Scott's interest in science and Shackleton's concern for his men with a high degree of technical skill and an outstanding ability to organize.

Byrd's first expedition to Antarctica (1928-1930) is best remembered for the first flight over the South Pole, on November 29, 1929. Probably even more important were the discoveries of the Ford Range, the Rockefeller Mountains, and Marie Byrd Land, and the work of the expedition's scientists under Dr. Lawrence Gould. Based at Little America on the Bay of Whales (the same bay that Amundsen had used), Byrd showed conclusively how effective the airplane—even with limited range—could be as a tool of exploration.

Byrd's second antarctic expedition (1933-1935) concentrated on scientific work and used tracked vehicles more extensively than any previous expedition. An advance weather base was set up over 100 miles south of Little America II, and Admiral Byrd stayed there alone from March 28 through August 10, 1934, keeping a careful record of the weather; no man had previously wintered so far south. During the winter carbon monoxide in the fumes from a faulty stove and from the engine that powered his radio very nearly killed Byrd before a rescue party reached him.

The type of scientific work carried on by Byrd was also performed by a British-Australian-New Zealand expedition (1929-1931) under Sir Douglas Mawson and the British Graham Land Expedition (1934-1937) under John Rymill. Scientific work received great impetus in another field from the British Discovery

Committee. Almost every year, this official group sent a ship to the Antarctic to study the seas and the plants and animals that lived in them. The committee hoped to discover enough about whales and their habits to save these valuable animals from the kind of destruction that had nearly wiped out the fur seals a century earlier. The ships of the Discovery Committee sighted land in many places, did mapping, and helped explorers.

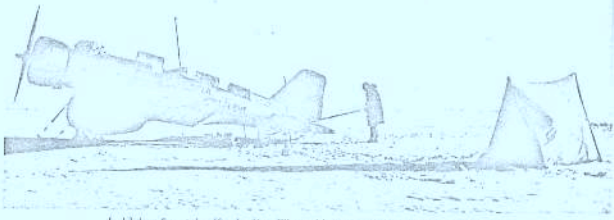
Other discoveries were made by the whalers themselves. Particularly active in this respect was the Norwegian whaling company directed by Lars Christensen. His factory ships carried airplanes to look for whales and to explore the coast of Antarctica. On some voyages, whaling captains took their wives along. On February 20, 1935, Mrs. Klarius Mikkelsen, the wife of one of Christensen's captains, accompanied her husband ashore in a small boat. As far as we know, she was the first woman to set foot on Antarctica. In 1937, Mrs. Christensen accompanied her husband on a whaling expedition and became the first woman to fly above the Antarctic Continent.

Admiral Byrd was not the only American to interest our country in Antarctica and stir the imagination of its youth. Another was Lincoln Ellsworth. A sportsman who loved the outdoors, Ellsworth lived a life of adventure. Like Byrd, he had experience in the Arctic and had flown over the North Pole before he first came to Antarctica in 1933. Ellsworth's great ambition was to fly across the continent. This he accomplished in 1935, after failing in two earlier attempts. With Little America as his destination, Ellsworth took off from Dundee Island on November 23, landing several times en route to determine his position or to wait out storms. Finally, on December 5, when his fuel gave out, he landed 36 miles short of his goal. He and his pilot, H. Hollick-Kenyon, hiked the rest of the way. During his final journey to the Antarctic in 1938-1939, Ellsworth surveyed from the air the area now called the American Highland.

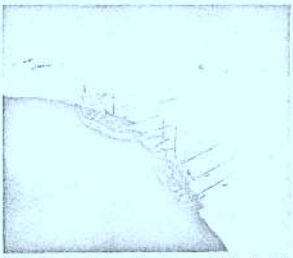
Rear Admiral Richard E. Byrd
1888 – 1957

"I am hopeful that Antarctica in its symbolic robe of white will shine forth as a continent of peace as nations working together there in the cause of science set an example of international cooperation.

During the same season, a small German expedition under Captain Albert Ritscher was busy mapping part of Antarctica's coast. Ritscher's technique was to operate seaplanes from a tender that remained just beyond the edge of the pack. In a very short time, the aerial cameras in his planes had photographed a large area.



In 13 days from takeoff to landing, Ellsworth's "Polar Star" was airborne 26½ hours. In planes like this, Byrd, Wilkins, and others probed the continent.



USMS "North Star" at West Base in 1940 with USS "Bear" (r.), the former "Bear of Oakland" of Byrd's second (1933-1935) expedition.

The use by Byrd and others of aircraft, tracked vehicles, radios, and complex scientific instruments gradually made private financing of expeditions almost impossible. Such equipment costs a lot of money and requires many men to keep it operating. Only governments can truly afford large scientific expeditions.

Toward Permanent Occupancy

The turning point came in 1939 when Congress authorized the establishment of the United States Antarctic Service Expedition under the command of Admiral Byrd. Two bases were set up in 1940: West Base, at Little America III on the Bay of Whales, was under the leadership of Paul Siple, who had first gone to the Antarctic as a boy scout with Byrd in 1928; East Base—under the leadership of Richard Black, a veteran of the second Byrd expedition—was located on Stonington Island in Marguerite Bay, off the west coast of the Antarctic Peninsula. As on previous United States expeditions, ground parties made long journeys to gather information. Aircraft were used to photograph unexplored areas beyond the reach of men on the surface.

The plans of the United States Antarctic Service called for permanent manning of East and West Bases. Each year a new group of men were to replace those who had stayed over the winter. In 1939, however, war broke out in Europe. As the conflict came closer to the United States, it was decided to close down the bases in Antarctica. West Base was evacuated on February 1, 1941, and the men at East Base were flown out on March 22.

World War II did not quite reach Antarctica, but it came close. German commerce raiders used subantarctic islands as places of refuge, and these same German ships captured the Norwegian whaling fleet. These actions so alarmed the British that they sent a military force to the Antarctic Peninsula in 1943. Led by Lieutenant Commander J. W. S. Marr, who had begun his antarctic experience as a boy scout on Shackleton's last expedition, the force set up a base off the west coast of the Antarctic Peninsula and another in the nearby South Shetland Islands.

When the war was over, the British decided to keep these bases as research sites and to open others. Since that time, they have occupied more than a dozen sites (some of them only briefly) along the Antarctic Peninsula, on nearby islands, and on the shore of the Weddell Sea. Each year, new groups of men relieve those who were engaged in scientific projects during the previous winter. Originally called the Falkland Islands Dependencies Survey, this program was retitled the British Antarctic Survey in 1961.

Argentina and Chile have adopted similar programs in the same general area. Besides continuing to operate their weather station on Laurie Island, the Argentines have established bases at many other points. The Chileans have occupied four bases, which they maintain regularly, and have built a number of huts for summer occupancy.

"Operation Highjump" flotilla pushes through pack ice to Little America IV.

The United States was the first country to plan permanent stations, but it did not pursue this plan after World War II. Instead, it went back to mounting expeditions that remained in Antarctica for limited periods. The first of these, in 1946 and 1947, was named *Operation Highjump*. Rear Admiral Byrd was the officer-in-charge, and Rear Admiral R. H. Cruzen commanded the Navy's Task Force 68. With 13 ships—including a submarine—and over 4,000 men, *Operation Highjump* remains the largest expedition ever sent to the Antarctic.

An outstanding event in the operation was the flight of six twin-engine C-47 transports from an aircraft carrier to their base of operations at Little America IV, on the Bay of Whales. Another was the successful use of icebreakers, with helicopters scouting

"Burton Island" (above) and "Edisto" used helicopters so extensively in 1947-1948 that the operation was unofficially called "Windmill." The first helicopters were brought to Antarctica the year before, during "Operation Highjump."

the way, to carve a path through the ice pack. Seaplanes operating from aircraft tenders—a technique Ritscher had pioneered—photographed large areas never before seen. The flights of the seaplanes and the C-47s resulted in the discovery during *Operation Highjump* of more of Antarctica than during all previous expeditions combined.

To make accurate maps from aerial photographs, the pictures must be related to definite points on the ground. Unfortunately, *Operation Highjump* had not obtained enough ground-control points, so the Navy sent the icebreakers *Edisto* and *Burton Island* to the Antarctic in 1947-1948. This expedition under Commander Gerald L. Kitchum was unofficially called "Operation Windmill" because it made extensive use of helicopters to put men ashore to obtain mapping references and to make scientific observations.

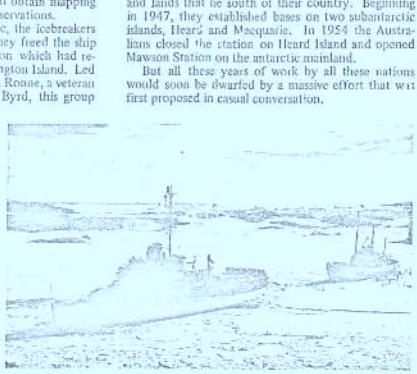
On the way out of the Antarctic, the icebreakers called at Marguerite Bay. There they freed the ship of another United States expedition which had reoccupied the old East Base on Stonington Island. Led by Commander (later Captain) Finn Ronne, a veteran of two expeditions with Admiral Byrd, this group greatly extended the work begun by the United States Antarctic Service in 1940 and 1941. Among the members of the wintering-over party were Commander Ronne's wife and Mrs. Darlington, the wife of one of the aircraft pilots. These were the first women ever to experience the hardships of an antarctic winter. Even though he had received extensive government assistance, Ronne's was the last privately organized United States antarctic expedition.

Early in 1950, the French returned to the Adélie Coast for the first time since its discovery by Captain Dumont d'Urville more than a century before. They established ground-control points so that aerial photographs taken during *Operation Highjump* could be used to prepare maps of the area around their base, and they conducted scientific investigations. By the time of their withdrawal in 1953, they had studied emperor penguins more thoroughly than anyone had before.

In the same season as the French arrival, a combined Norwegian-British-Swedish expedition (1949-1952) came ashore near Cape Norvegia. Like other postwar groups, it brought much new scientific equipment. Particularly interesting was their seismographic study of what lay beneath the ice. This is done by setting off a dynamite explosion and measuring the time that it takes for the shock wave to travel down through the ice, bounce off solid rock, and return to the surface. The time between the explosion and the receipt of the echo indicates the depth of the ice, and a pattern of these measurements shows the shape of the buried land. The expedition found this portion of Queen Maud Land to be like Norway: a land of high hills, steep slopes, and deep valleys.

Australians have long been interested in the seas and lands that lie south of their country. Beginning in 1947, they established bases on two subantarctic islands, Heard and Macquarie. In 1954 the Australians closed the station on Heard Island and opened Mawson Station on the antarctic mainland.

But all these years of work by all these nations would soon be dwarfed by a massive effort that was first proposed in casual conversation.



Icebreaker "Burton Island" freeing Finn Ronne's "Port of Beaumont" from ice at Stonington Island. Ronne's was last privately organized American expedition and included two women in the wintering-over party.

All-Out Assault: The IGY

De Havilland Otter swoops low over Sno-Cat to resupply IGY traverse.

Admiral Byrd liked to think of Antarctica as a great white continent of peace, a place where men of all nations could work together to expand the frontiers of human knowledge. He lived long enough to see his dream on its way to accomplishment. When he died in 1957, a dozen nations were engaged in an all-out assault to unlock the secrets of Antarctica's icy wastes.

An International Effort

This effort in Antarctica was part of the International Geophysical Year, a program of cooperative scientific investigation in all areas of the world. Over 60 nations and 30,000 individual scientists participated. From July 1, 1957, to December 31, 1958, they manned more than a thousand stations from North Pole to South Pole and around the Earth from east to west. The results of the programs of simultaneous observation were sent to several World Data Centers and are available to scientists everywhere.

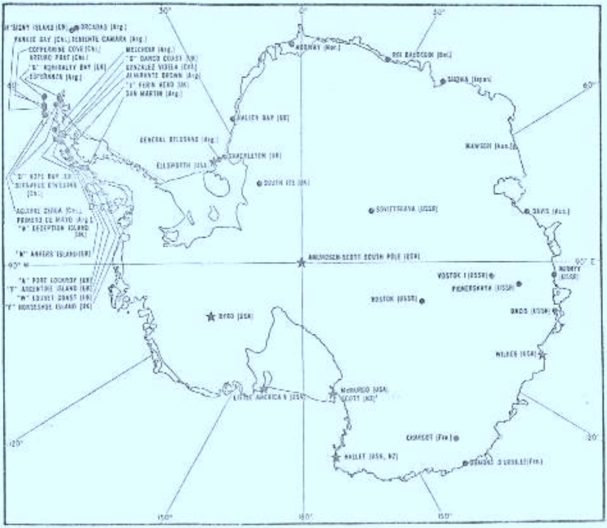
The geophysical sciences—which are often called the earth sciences because they deal with the Earth and the forces which affect it—include oceanography, meteorology, upper atmosphere physics, and glaciology; all of these were part of the IGY program. The program did not, however, include biology, geology, and mapping, which have long occupied men in the Antarctic.

The idea of such an international scientific effort was not without precedent. A century ago, a United States naval officer who was also one of the first oceanographers, Commander Matthew Fontaine Maury, suggested that the maritime nations of Europe and America join together in studying the Antarctic. Nothing came of this proposal because of the outbreak of the Civil War in this country. The idea did not die, however, and it was revived in a different form in 1875 by Lieutenant Karl Weyprecht of the Austrian Navy, after his return from an arctic expedition. At his urging, 11 nations established 14 stations in and about the polar regions during 1882-1883. Only the station located on South Georgia was south of the Antarctic Convergence, but another, at Cape Horn, was not far to the north. This first International Polar Year was followed by a second one 50 years later, during 1932-1933, in which 44 nations participated. Again, the Antarctic received little attention.

Birth of the IGY

On the evening of April 5, 1950, a group of friends gathered at the home of Dr. James A. Van Allen in a suburb of Washington, D. C. Among those present were Dr. Sidney Chapman, a famous British geophysicist, and Dr. Lloyd Berkner, an American geophysicist who in his twenties had been a radio engineer on Admiral Byrd's first antarctic expedition. During the conversation, Dr. Berkner suggested that the time had come for a third polar year. Among other reasons, he pointed to the rapid advance of all the geophysical sciences and the fact that the sunspot cycle had been near its minimum during the two earlier polar years. A third such year, coming in 1957-1958, just 25 years after the previous one, would find the sunspot cycle near its maximum.

With the encouragement of those present, Drs. Berkner and Chapman interested international scientific organizations in the idea. Many of those consulted felt that the value of the observations would be greater if they were not limited to the polar regions.



Antarctic stations during the International Geophysical Year.

Much could be learned by comparing and combining information from these regions with similar information from tropical and temperate zones. The matter was considered by the International Council of Scientific Unions, to which most of the national academies of sciences in the various countries belong. This body decided that a worldwide effort was needed and designated it the International Geophysical Year. It also organized a special committee to develop a program and to coordinate the effort of the world's scientists.

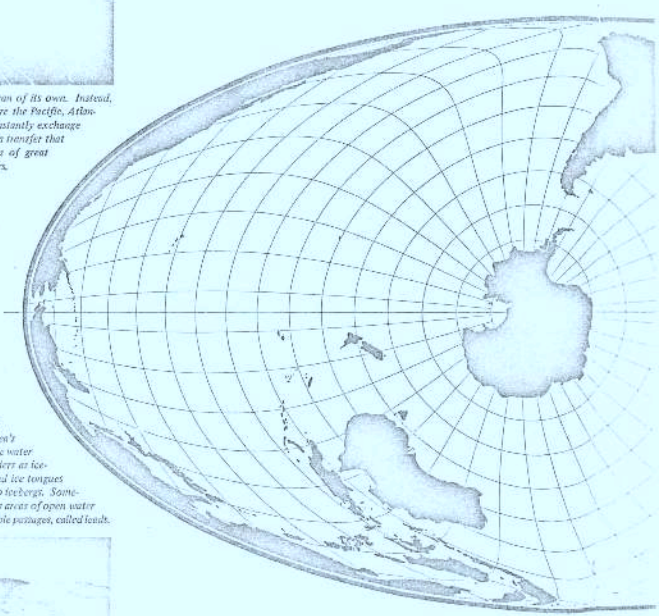
This committee established subcommittees for the different scientific studies as well as several for regions that posed special problems. Included among these subcommittees was one for the Antarctic because that region was believed to be "of almost unparalleled interest in the fields of geophysics and geography alike."

These subcommittees developed programs of scientific investigation, but it was left to each country's national academy to decide how much and which portion of these programs it was able and willing to carry out. What happened in the United States is typical of what happened in over 60 nations. Our National Academy of Sciences set up a committee for the International Geophysical Year, and this committee, in turn, created subcommittees, including one for the Antarctic. The honorary chairman of our antarctic committee was Admiral Byrd; the chairman was Dr. Laurence Gould, the chief scientist of Byrd's 1928-1930 expedition.

From the beginning, the United States Government said that it would support the program with the necessary funds. Gradually the Government, represented by the National Science Foundation, and the scientists determined just how much of the international scientific program the United States could afford. With this information, our scientists could go to in-

THE GEOGRA
ANTARCT

e Antarctic has no ocean of its own. Instead, is a meeting place where the Pacific, Atlan-, and Indian Oceans constantly exchange ıt, salt, and minerals—a transfer that r global effects and is of great terest to oceanographers.

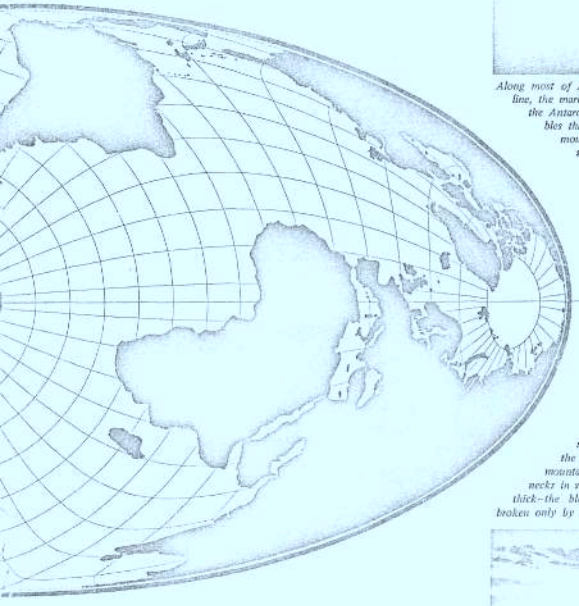


e in the waters ound Antarctica y take many forms. me result from the nter freezing of the sea's rface; other ice enters the water m the continent's glaciers as ice- rgs, or at ice shelves and ice tongues t eventually give rise to icebergs. Some- es the ice pack contains areas of open water (lynyas) or even navigable passages, called leads.

In this unusual map, the spherical earth is portrayed as a flat ellipse so th

GRAPHY OF
RCTICA

Along most of Antarctica's 18,500-mile coastline, the mariner sees cliffs of ice. But in the Antarctic Peninsula the coast resembles that of Norway, with sea-lapped mountains and awesome fjords presenting a view of frozen splendor.



The polar plateau is as unsoftened by water erosion as the coast. Here—where majestic mountains are often buried to their necks in snow and ice thousands of feet thick—the bleak white spectacle may be broken only by isolated peaks called nunataks.

t ellipse so that the surface areas maintain their relative sizes.

ternational meetings and tell the scientists of other countries what we were prepared to do.

When the representatives of all the nations met together, they sometimes found that several countries had decided to do the same thing. In other cases, no one had volunteered to undertake a desirable project. Working together, they made many changes. Duplications were eliminated and gaps filled in. Scientists from all over the world had a common objective—to increase the body of scientific knowledge by making the International Geophysical Year a success.

The antarctic program of the IGY called for scientific stations not only on the continent and offshore islands, but also on more northerly islands and in Australia, New Zealand, South Africa, and South America. This extensive coverage was designed to tie the Antarctic into Southern Hemisphere and worldwide patterns of observation. For example, it would be possible for the first time to make weather charts of the entire southern end of the world.

Twelve Nations

Twelve nations responded to the program of the international committee for Antarctica. They were Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Union of Soviet Socialist Republics, the United Kingdom, and the United States. Most had previous antarctic or arctic experience on which to plan their expeditions. They agreed to the establishment of over 60 scientific stations. The most daring idea brought forward was the basing of scientific parties on the great polar plateau. Except for Byrd's solitary stay at an advance base during his second expedition, no man had ever attempted to pass the dark antarctic winter away from the seacoast.

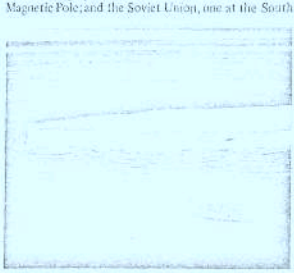
The United States offered to set up a station at the South Geographic Pole; France, one at the South Magnetic Pole; and the Soviet Union, one at the South Geomagnetic Pole. The United States and the Soviet Union also proposed to establish other stations on the plateau. As a supplementary project, not strictly a part of the IGY, the nations of the British Commonwealth revived Shackleton's plan for a journey across Antarctica from the shores of the Weddell Sea to McMurdo Sound.

The programs put forward by the various countries required advance preparations. Although the International Geophysical Year was not to begin until July 1, 1957, the United States Navy sent the icebreaker USS *Atka* to the Antarctic in the autumn of 1954 to locate sites for stations. *Atka* found that the Bay of Whales had disappeared when pieces of the ice shelf had broken off and floated away as icebergs, carrying to sea part of Little America IV, which had been set up during *Operation Highjump*.

Most of the major expeditions got under way the next summer, 1955-1956. This early a start was necessary—especially for those countries that planned to have stations on the plateau—because journeys and base construction could not be undertaken during the antarctic winter. Men must take advantage of the months of daylight and comparative warmth. They must begin their work as early in the spring as possible: about October 1. Ships, however, usually cannot pierce the pack ice until December, so building materials, equipment, and supplies had to be shipped in during one summer and stored over the antarctic winter for use the following spring. If the buildings were to be erected, the scientific instruments in place, and everything ready by July 1, 1957, the expeditions had to start shipping material in late 1955.

Deep Freeze Begins

For its logistic operations in the Antarctic, the United States Navy uses the nickname *Deep Freeze*. On *Operation Deep Freeze I* (1955-1956), the Navy



This iceberg, sighted by "Atka" in 1955, contained parts of Little Americas III and IV. Most of Little America IV had gone to sea before "Atka" arrived in 1954.

established two stations. Little America V was at Kainan Bay, about 30 miles east of where Admiral Byrd had set up four previous Little Americas. Admiral Byrd, on his last trip to the Antarctic, was at the commissioning ceremony. The other station was built on Hut Peninsula on Ross Island in McMurdo Sound, near the spot where the British explorer Captain Scott had based his first expedition. Originally named the Naval Air Facility, McMurdo Sound, it was renamed McMurdo Station in 1961. The building materials for Byrd Station—which was erected the following summer at 79°59'S., 120°01'W.—were stored at Little America V, while the materials for the station at the South Pole were stockpiled at McMurdo.

On December 20, 1955, four United States Navy aircraft (two standard C-54s and two ski-equipped P2V Neptunes) flew from New Zealand to McMurdo Sound in 14½ hours. For the first time, large cargo aircraft had taken off from a distant land mass and set down on the Antarctic Continent. While they were in Antarctica, these planes made a series of exploratory flights covering almost two million square miles—about half of which had never before been seen.

P2V Neptune on ice of Winter Quarters Bay. At right, Scott's 1902 hut.

The expeditions of other nations were equally busy. A French expedition arrived off the Adélie Coast at Point Geologie on January 1, 1956. They built a scientific station that they named Dumont d'Urville in honor of their great explorer of a century before. The British set up two stations along the Weddell Sea; one was a scientific station at Halley Bay, the other a logistic base on the Filchner Ice Shelf to support the British Commonwealth Trans-Antarctic Expedition. This second base they named after Shackleton, who had first proposed crossing the continent.

The Soviet Union sent an expedition that established a station in Queen Mary Land, off the Indian Ocean. Although a Soviet whaling fleet had been active since World War II, this was the first Russian expedition to the Antarctic since the days of Bellingshausen in 1820-1821. They named their station Mirnyy, after one of his ships. The Soviets had considerable experience with cold-weather operations in the Arctic, and they brought a great deal of proven equipment. During their first season they succeeded in setting up an inland station, Pionerskaya, 235 miles south of Mirnyy and at an elevation of almost 9,000 feet. The four men who remained there were the first to spend a winter on the antarctic plateau.

While these expeditions were going on, other countries continued their already established programs—Argentina, Chile, and the United Kingdom on the Antarctic Peninsula, and Australia at Mawson Station and on Macquarie Island. The 1955-1956 expeditions were really preliminary. The big effort came the following year.

Invasion for Science

The 1956-1957 season, which the United States refers to as *Deep Freeze II*, was the greatest invasion of Antarctica in history. Never before had so many men from so many countries set forth for that continent, nor had so many of them gone with the intention of spending the winter there. The United States sent 12 ships and over 3,000 men. In addition to naval aircraft like those of *Deep Freeze I*, eight Air Force C-124 Globemasters were sent. These large cargo planes were to drop building supplies and materials at the South Pole. They would also help the

C-124 drops fuel to Byrd Station. Air Force C-124s continued this service until 1963.

First plane to land at the South Pole, "Que Sera Sera" has been preserved for museum display.

tractor train that was to carry materials to the Byrd Station site by parachuting fuel along the route.

Before these operations began, the commander of the United States expedition, Rear Admiral George J. Dufek, flew to the South Pole on October 31, 1956. He and his crew were the first men to stand at the bottom of the world since the parties of Amundsen in 1911 and Scott in 1912. When they stepped from their plane, an LC-47 named *Que Sera Sera*, they found the temperature at -58°F. and the wind blowing hard. Admiral Dufek decided to wait three weeks for the weather to warm up before sending in men to build the station.

While the South Pole crew was waiting, a group of Army and Navy men set out from Little America V to mark a trail to the site of Byrd Station. The Army men, who had served in Greenland, were specialists in travelling over snow and ice. As Admiral Dufek said, the Navy had plenty of men who knew how to drive tracked vehicles, but they lacked experience in the polar regions. For that reason, he had asked the Army for experts. The Army was glad to help, just as the Air Force was glad to send specialists in dropping supplies from the air, and Army, Navy, and Air Force men labored together to establish our two inland stations.

While these men were busily at work in the interior, Navy ships and construction crews set up three coastal stations. One was on Cape Hallett in the Ross Sea. Here, United States and New Zealand scientists would work together. A second was established on the Knox Coast in that part of Antarctica which had first been seen by Wilkes in 1840, and it was given his name. The third received the name of Ellsworth, another American explorer. It was built on the shore of the Weddell Sea, across the continent from McMurdo Station. Like other nations, the United States frequently honored the pioneers of exploration by naming antarctic stations after them, and the two in the interior were named Byrd Station and Amundsen-Scott South Pole Station. When the last ships and aircraft left the area in February and March 1957, 317 Americans remained behind at the seven U. S. stations.

The French established a base, named Charcot, near the South Magnetic Pole, and the British Commonwealth Trans-Antarctic Expedition set up a small station called South Ice between Shackleton Base and the South Pole. The Soviets added Vostok, named for the second of Bellingshausen's ships, and Oazis, in an ice-free area of the Knox Coast, to the already existing bases at Mirnyy and Pionerskaya. With the addition of Norway and Japan, each of which built one base, 10 nations had scientific stations on the Antarctic Continent, while the Belgians were planning one, and South Africans manned sites on three subantarctic islands.

Successful Start for IGY

The target date was July 1, 1957. A few days before the scheduled beginning of the International Geophysical Year, the sun began to show signs of increasing activity. Telltale spots on its surface indicated numerous gigantic explosions. The IGY started during one of the greatest of recorded magnetic storms, and scientists all over the world were ready.

This beginning was prophetic. The scientists sprinted from one success to another, their results far exceeding the hopes of those who had planned this great scientific effort. In the Antarctic, as elsewhere, men from different nations worked together in harmony. Stations throughout the Antarctic sent their weather reports to the weather forecasting center at Little America V. At the weather central, men from several nations received and interpreted these reports. For the first time in history, weather charts of the whole area were drawn up.

This cooperative spirit extended beyond the scientific programs to the support forces. For example, the Japanese vessel *Sōya*, which encountered difficulty with the ice in 1957, was assisted by the Soviet expedition ship *Ob'*. Such help by one expedition to another has continued past the IGY to be an outstanding and recurrent feature of antarctic activity. United States icebreakers have been sent to aid beset ships of Japanese (in 1958), the Belgians (1959), the British (1960), and the Australians (1967). In January 1960, the Argentine icebreaker, *General San Martín*, escorted through the ice of the Weddell Sea a Norwegian sealer, *Polarbjorn*, which the South Africans had chartered. In early January 1962, an Australian expedition member at Mawson Station was stricken with an ailment that required his evacuation. The patient and the station's physician were picked up by a Soviet airplane and flown to McMurdo Station by way of Mirnyy. From McMurdo, the ailing Australian was carried in a U.S. aircraft to New Zealand, where he was placed aboard a commercial airliner bound for Australia. At

United States Stations for the IGY

The United States built seven stations for use during the International Geophysical Year (1957-1958). McMurdo Station, which was established as an air-support base, has grown into the major supply center pictured on page 41. Little America V, on the other side of the Ross Ice Shelf, was closed down in late 1959, crushed by snow. Byrd Station was quickly drifted over, and operations were shifted to an undersnow replacement station during the summer of 1961-1962. Amundsen-Scott South Pole Station, though temporarily rescued from the same danger, will need replacement. Wilkes and Ellsworth Stations were transferred to other countries after the IGY. Hallett Station, pictured on page 40, is still in use, but now only in summer.

Coastal Wilkes Station was dominated by an antenna for ionospheric research.

The station at South Pole was constructed using the bulldoze-and-board technique developed by Admiral Byrd for temporary stations.

"Main Street" of Little American V under construction on the Ross Ice Shelf during the 1955-1956 season.

With 13 months left in the IGY, snow accumulation at Byrd Station already was significant.

September 1957: The sun rises over Ellsworth Station after the first austral winter of the IGY.

Soviet IL-18 arrives at McMurdo with Australian evacuee.

each stop, he received medical aid, and he was completely recovered shortly after his return home.

Deep Freeze III

The antarctic summer of 1957-1958, *Deep Freeze III* for the United States, was largely a period of relief and resupply. New groups of scientists, technicians, and support personnel arrived to take over from those who had already spent a year in the Antarctic. In December 1957, the Belgians became the twelfth nation to join the program; they established a base—on the shore of the Indian Ocean at 70°S., 24°E.—which they named after their sovereign, Roi Baudouin.

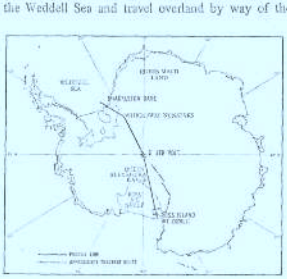
That summer was also a season of great journeys. The best known was the crossing of the continent by the British Commonwealth Trans-Antarctic Expedition. The plan resembled that of Shackleton for his 1914 expedition, though altered to take advantage of modern equipment such as tracked vehicles and light aircraft. The main party, under the leadership of Dr. (now Sir) Vivian Fuchs, was to land on the shore of the Weddell Sea and travel overland by way of the South Pole to McMurdo Sound on the Ross Sea. A supporting party from McMurdo Sound was to lay depots of food and fuel on the Ross Ice Shelf and the polar plateau for the use of Fuchs and his companions during the final stage of their crossing. The depot-laying was primarily a New Zealand affair under the leadership of Sir Edmund Hillary, who a few years before had been the first man to climb Mount Everest.

Starting out in October, the New Zealanders, using slightly modified farm tractors, pushed across the Ross Ice Shelf and up Skelton Glacier to the polar plateau. They put down depots of supplies and marked a trail for Fuchs to follow later. Originally, they had intended to go about 700 miles from their base at McMurdo Sound and then return. Hillary found, however, that he had enough fuel to push on to the South Pole. He and his companions arrived there on January 4, 1958, the first men to travel overland to this isolated spot since the days of Amundsen and Scott.

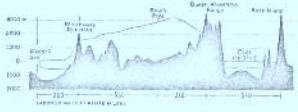
Crossing of the Continent

Fuchs had set out on November 24, 1957, from Shackleton Base on the Weddell Sea. His party used two kinds of American-made tracked vehicles, the Weasel and the Sno-Cat. A dog team pulled a sled ahead of the vehicles to pick out the best route through untravelled country. Even with the help of the dogs, the journey was dangerous and difficult. Several times, Sno-Cats—which are big enough for men to live in—fell partway into crevasses, and the men had a hard time getting them out. On January 19, 1958, Fuchs reached the South Pole.

For a few days, Fuchs and his men rested. Then they pushed on. Because Hillary had already marked a route, the dogs were no longer needed, and they were flown to McMurdo. A few days out on the trail, Fuchs abandoned the Weasel. Besides the fact that



The 1,700-mile cross-section below is based on soundings along the solid line on map at left. From the Weddell Sea to the South Pole, the profile matches part of the 2,158-mile route of the British Commonwealth Trans-Antarctic Expedition, which then travelled to Ross Island along path indicated by broken line. (Profile elevations in meters.)



Main party of British Commonwealth Trans-Antarctic Expedition arrives at Amundsen-Scott South Pole Station.

it had begun to break down, it was not as fast as the Sno-Cats, and Fuchs had to hurry to finish his journey before another winter began. On March 2, 1958, he reached New Zealand's Scott Base on Ross Island.

The British Commonwealth Trans-Antarctic Expedition had made Shackleton's dream come true. It had traversed from the shores of the Weddell Sea to those of the Ross Sea. Along the way, the men had made seismic soundings and gravity measurements to learn how deep the ice was. Even before the United States had established Byrd Station and found that it was 5,000 feet above sea level only because it stood on 8,000 feet of ice, many people had doubted that Antarctica was a continent. They thought it might be a group of mountainous islands covered by a single ice cap, but Fuchs found, over most of his route across East Antarctica, that the land under the ice was above sea level.

While Fuchs and his men were making their journey, scientists of other countries also travelled over the face of Antarctica carrying on their studies. On their traverses, the scientists investigated the thickness and nature of the ice, recorded the weather, and measured changes in the pull of gravity and the Earth's magnetism. By observing the sun ("shooting the sun," as they call it), they could calculate their exact location, an important step in making accurate maps. Geology and biology were not part of the basic IGY program, but the scientists stopped to collect rocks, plants, and insects where mountains poked through the ice or where the snow melted away in summer.

By the end of 1958, the traverse parties and the scientists at the stations had collected a vast amount of information—enough to convince them that their work during the International Geophysical Year was too valuable to stop. It had originally been planned that the United States stations, and most others, would be closed after the IGY ended on December 31, 1958, leaving Antarctica largely as it had been for centuries, a snowy sanctuary for seals and penguins. But instead of ending their search for knowledge in Antarctica, the scientists were in many fields just getting a good start. As a result, *Deep Freeze IV* in 1958-1959 —which was to have ended the effort at the United States stations—saw new groups of scientists and support personnel arrive to continue the scientific investigations. Other countries also decided to maintain their antarctic stations. The end of the IGY actually brought new strength to Admiral Byrd's hopes for Antarctica.

In December 1956, an R-19 hovered in farewell as tractors left Little America V, towing sleds laden with materials to build the first Byrd Station. The wide-tracked bulldozers—each weighing 35 tons but exerting no more pressure than a man (3 psi)—made the 600-mile trek at walking speed. Today, U.S. scientists work at a new Byrd Station built with airlifted materials.

Ten years of Antarctic research

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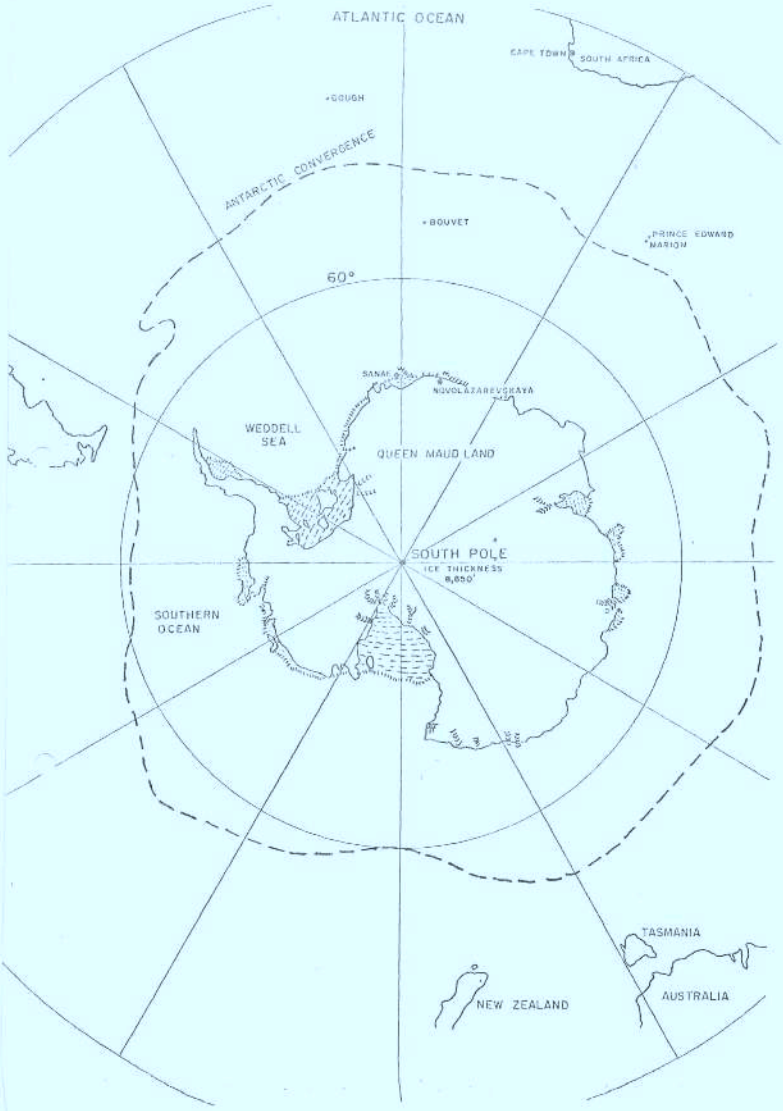
ATLANTIC OCEAN
CAPE TOWN
SOUTH AFRICA
GOUGH
ANTARCTIC CONVERGENCE
BOUVET
PRINCE EDWARD
MARION
60°
SANAE
NOVOLAZAREVSKAYA
WEDDELL SEA
QUEEN MAUD LAND
SOUTH POLE
ICE THICKNESS
8,850'
SOUTHERN OCEAN
TASMANIA
AUSTRALIA
NEW ZEALAND

Scientiae

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GEORGE STOOP, Editor

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Wat gaan daar voor aan? Hierdie verspieder wat sy stee op die anteen van Antarktika is sinebolica van die taak van die wetenskap daar.

ANTARKTIKA

— land van internasionale naversing

VYFMILJOEN vierkante myl van ysige verlatenheid waarvoor stormwinde van orkaansterkte swiep en alles platvee; droë wit woestyngebied waar die reën nooit val nie en die sneeuneerslag per jaar aan slegs sowat ses duim reën gelyk staan; ongenaakbare dooie gebied met byna onoorkomlike skanse van dodelike koue; hedrieglike ysberge en ruwe stormagtige see — dit is Antarktika, die land wat met byna elkeen van sy karaktertrekke aan die mens probeer beduie: Bly hier weg!

HIERDIE onherbergsame suidpoolland waarop slegs skuins en robbe en pikkewyne 'n natuurlike bestaan kan voer, het reeds sedert 1598 toe dit die eerste keer op Wytfield se kaart van die wêreld ingeteken is, die mens se verbeelding aangegryp. 'n Aantal ontdekkers het, ten spyte van die natuur se versperrings, na hierdie vreemde land deurgebreek en baanbrekerspore na die suidpool opgetrap. Menigeen het daar die lewe ingeskiet terwyl hy meer kennis oor hierdie onbekende wêreld probeer inwin het.

Dit alles ten spyt het Antarktika sy geheime steeds bewaar sodat daar nog so onlangs as tien

jaar gelede maar bloedweinig van hierdie kontinent — die vyfde grootste op aarde — bekend was.

Tien jaar gelede is die Internasionale Geofisiese Jaar (I G J) van stapel gestuur. Een van die hoofdoelwitte van hierdie program van ko-operatiewe en aanvullende studie van die aarde en sy omgewing deur wetenskaplikes, was die wetenskaplike verkenning van Antarktika. Twaalf lande, waaronder ook Suid-Afrika, het saam 48 navorsingsposte op die grense en in die binneland van die yskontinent opgerig en beman. Navorsingsresultate is saamgegooi en die eerste brokkies kennis van 'n vreemde wêreld het daaruit tevoorskyn gekom.

Bres

'n Bres is in Antarktika se skanse geslaan en stadigaan het die land sy geheime bekend gemaak aan die manne wat bereid was om groot persoonlike opofferings te maak en die natuur se strafste aanslae ter wille van die wetenskap te trotseer.

Aan die begin van die I G J was Antarktika nog die **terra incognita** van hierdie planeet. Ondanks die prestasies van die afgelope tien jaar is dit in baie opsigte nog steeds die geval. Ons weet dalk al veel meer van die ruimte bokant ons as van hierdie suiderland onder sy dik yskombers.

Hoewel Suid-Afrikaanse weerkundiges baie vroeg reeds die invloed van Antarktiese en sub-Antarktiese gebiede op die weer, nie alleen in Suid-Afrika nie maar oor die ganse suiderhelfte van die aarde, herken het en reeds in 1948 die eerste weerkundige waarnemingstasie op Marion-eiland gevestig het, het ons eers in 1957 met die Antarktiese kontinent self kennis gemaak. 'n Suid-Afrikaner, Hannes la Grange, het naambik in dié jaar die Trans-Antarktiese Ekspedisie van sir Vivian Fuchs meegemaak.

Uit erkenning vir Suid-Afrika se belangstelling en samewerking is aan die Departement van Vervoer se Afdeling Weerburo die mak opgedra om die weerkaarte vir die Suidelike Halfrond vir die I G J te analiseer en is Suid-Afrika saam met elf ander lande genooi om in die Wetenskaplike Komitee vir Antarktiese Navorsing (S C A R) van die Internasionale Raad van Wetenskaplike Unies (I C S U) te dien. Die sukses wat hierdie komitee met sy koördinasie van Antarktiese navorsing tydens die I G J behaal het, was een van die belangrikste faktore wat tot die formulering van die Antarktiese Verdrag in 1959 gelei het.

Na afloop van die I G J het ons voortgesette deelname aan die aktiwiteite van die komitee tot gevolg gehad dat die eerste Suid-Afrikaanse Antarktiese Ekspedisie in Januarie 1960 vertrek het om die Noorweegse I G J-pos in die westelike Koningin Maudland te gaan oorneem. Sedertdien het die Republiek sy eie permanente navorsingspos, SANAE, in die yswêreld ingerig en stuur hy elke jaar 'n aflosspan wetenskaplikes per skip soontoe (die Departement van Vervoer het in 1961 die spesiaal versterkte R S A vir hierdie doel aangekoop) om 'n bydrae te maak tot die verryking van die wêreld se kennis oor hierdie groot land waaroor daar nog so veel te leer is.

Die grootste enkele wetenskaplike navorsingsprogram te SANAE is ongetwyfeld die weerkundige program wat deur die S.A. Weerburo van die Departement van Vervoer georganiseer en onderneem word. Weerkundige waarnemings word aangevul deur dié wat op die sub-Antarktiese eilande Marion en Gough en ook aan boord van walvisbote in suidelike waters gemaak word; daar word verder ook 'n weerstasie op Bouvet in die vooruitsig gestel. Saam met ander lande stort Suid-Afrika sy weerkundige waarnemings in 'n gesamentlike pot waar dit bestudeer en ontleed word. Stadigaan leer die wetenskap die aarde se weer verstaan, en Suid-Afrika se bydrae hiertoe moet geensins gering geskat word nie.

Spesiale fonds

Die Republiek se ander navorsingsprogramme in die suidpoolgebied word gefinansier uit 'n spesiale fonds wat vir die doel deur die Staat bewillig word en deur die Departement van Vervoer geadministreer word. Die programme self word deur die W N N R se Wetenskaplike Komitee vir Antarktiese Navorsing gekoördineer en deur die Suid-Afrikaanse universiteite en ander instansies onderneem, terwyl die Departement van Vervoer logistiese ondersteuning bied. Hierdie programme kan hoofsaaklik in drie kategorieë ingedeel word, nl. die programme vir bofugfisika wat hoofsaaklik met 'n studie van die suidelike magnetiese anomalie gemoeid is, die aardkundige programme wat met 'n studie van die kontinent Antarktika self te doen het, en 'n breedvoerige biologiese en geologiese studie van Marion- en Prince Edward-eiland.

Die programme vir bofugfisika dek onder meer navorsing op die gebied van die ionosfeer, kosmiese strale, luggloed, aurora en geomagnetisme. Hierdie

'n Blik op Kaap Circumcision, Bouvet-eiland. Die Weste-windstrand steek vega bo uit.

program is almal daarop gemik om 'n beter begrip te verkry van die verskynsels wat met die sogenaamde Suidelike Magnetiese Anomalie, suidwes van die Kaap, gepaard gaan. Volgens satelliet- en ander waarnemings wil dit voorkom asof SANAE naby die middelpunt van die anomalie en dus besonder gunstig geleë is vir navorsing van hierdie aard.

In die afgelope vyf jaar het Suid-Afrika se aardkundige navorsingsprogram in die koue suiderland op treffende wyse uitgebrei. Afgesien van basiese geologiese kartering, maak seismologie, veldgeofisika, oseanografie en gletserkundige hulplartografiese projekte nou 'n aansienlike deel uit van die veelvuldige navorsingsaspekte wat deur hierdie aktiewe program gedek word. Die geslaagde S C A R-simposium oor Antarktiese Geologie wat in September 1963 in Kaapstad gehou is, het weer eens die aandag gevestig op die wetenskaplike waarde van hierdie basiese navorsingsprogramme en die internasionale erkenning wat hulle Suid-Afrika besorg.

Gedurende 1965 is daar 'n uitgebreide biologiese en geologiese ekspedisie na Marion- en Prince Edward-eiland onderneem. Tydens hierdie ekspedisie is baanbrekerswerk op die gebied van die geologie, plantekologie, ornitologie, palinologie, limnologie en die taksonomie van diere en plante daar gedoen. Die resultate, wat reeds aansienlike belangstelling in die buiteland gewek het, word tans in samewerking met ander lande se deskundiges verwerk.

Tien jaar in Antarktika

In die tien jaar wat verloop het sedert die wetenskap sy soeklig op Antarktika gerig het, is 'n skat aan kennis oor dié vasteland reeds versamel. Die twaalf lidlande van S C A R vier vanjaar hul tiende navorsingsjaar in Antarktika by wyse van 'n spesiale „Antarktika-dag." Die publiek word dan ook allerweë deur middel van rolprentvertonings, praatjies, tydskrifartikels en so meer oor die prestasies van die wetenskap in Antarktika ingelig.

Ook *Scientiae* dra vandeesmaand die werk uit wat Suid-Afrikaners in die vreemde op verskeie gebiede van die wetenskap doen en gedoen het. Hulle werk, wat in veeleisende omstandighede gedoen word, het reeds in internasionale wetenskaplike kringe vir die Republiek die hoogste agting gewek.

Guardian of South Pole Science

INTERNATIONAL scientific co-operation in Antarctica led to the conclusion of a political contract without precedent — the Antarctic Treaty.

The primary aim of the treaty is to ensure the continuation of international scientific research in Antarctica. The first treaty ever designed to protect a scientific programme, it is symbolic of the world of science which knows no national or other political boundaries.

Its six main provisions bear witness to its unusual character. The Antarctic Treaty —

- **ensures the continuance of the international scientific co-operation which characterized the I G Y**
- **reserves Antarctica for peaceful purposes only**
- **guarantees the non-militarization of the whole continent of Antarctica.**
- **prohibits all nuclear explosions on the continent**
- **provides for an unprecedented system of unilateral inspection of any part of Antarctica by observers of any signatory nation**
- **freezes all national territorial claims and rights for 30 years from the date of the signing of the treaty.**

The Antarctic Treaty was signed in Washington D.C. on 1st December, 1959, by representatives of twelve nations — Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, United Kingdom, USA and USSR — and officially implemented from 23rd June, 1961. Provision was made by the nations which originally ratified the treaty for accession by other nations, whether directly involved in Antarctic research or not. At the end of 1965 there were 15 signatory nations, the new signatories being Czechoslovakia, Denmark and Poland.

The treaty created no formal secretariat or organization, but the signatory nations meet every year or two to discuss problems of mutual concern. Designed to protect the scientific programme in Antarctica, the treaty left to SCAR, a non-governmental organization, the co-ordination of that programme.

Conservation

Since the treaty was implemented, the signatory nations have approved numerous measures for greater co-operation in Antarctica, among the most important of which is the "Agreed Measures on Conservation." Antarctica provides scientists with a unique opportunity for studying a continent which because of its isolation and because it has never been the home of man, has a flora and fauna which represents the only sizable assemblage of organisms on earth as yet uncontaminated by man. No new plants or animals have been introduced into the area and these conservation measures aim at preserving Antarctica as far as possible in its natural state.

The treaty aims to ensure that scientists will be given every opportunity of working together to coax the icy vastness of Antarctica to yield up its treasures for the enrichment of man's knowledge of the world in which he lives, to provide resources which every nation can use, and to work towards a world that will yield enough for every man in every country.

Antarctica and the weather

The Polarbjørn, on which members of the first SANAE expedition sailed, in 1959, trapped in ice. The photograph was taken from the bridge of the Argentinian ice breaker, Eva Maria which came to the rescue.

INTENSIVE research into weather conditions in the Antarctic is being undertaken by a number of nations, including South Africa. The purpose of this research is to obtain a better understanding of the air circulation patterns which determine weather conditions throughout the world.

SCIENTISTS have long realised that the interaction of the warm air from the equator with the cooler air masses of the polar regions plays a vital role in weather conditions throughout the world. A concerted effort is, therefore, being made to probe this interaction with the aid of modern scientific instruments.

The basic movement of air surrounding the globe is brought about by the differential heating of the earth's surface by the sun. As the earth receives more radiation near the equator, the air becomes heated and rises, creating a low pressure area which causes air from higher latitudes to flow towards the equator.

Meanwhile, the hot air is slowly cooled as it rises and drifts towards the north and south poles. Once over these regions, it is rapidly chilled by what have been called the biggest heat drains in the world — the polar ice caps. This cold air then slowly circulates back to the equator where it is reheated and the cycle of air movement is repeated. Numerous factors such as the presence of land masses and topography influence the pattern of air movement, but the interaction of the hot air at the equator and the cold air at the north and south poles has a greater influence on air circulation patterns.

During the past fifteen years, a number of research teams based in the Antarctic have obtained valuable information in this respect, but the two main questions being asked by scientists are: What is the role of the Antarctic continent in the general circulation of the atmosphere and how does the Antarctic influence the weather in the Republic?

Gigantic

As the south polar region contains probably more than 90 per cent of the world's supply of permanent ice, it acts as a gigantic reservoir of cold air and influences the earth's

climate by cooling the air masses which circulate above its surface as well as the seas surrounding it.

During the International Geophysical Year (I G Y), twelve nations set up 57 meteorological stations in the Antarctic region, most of which are still in operation today. These stations provided us with most of the knowledge we have of the continent, and South Africa played a prominent part in this research. The South African Weather Bureau of the Department of Transport, in 1957, published a book "Meteorology of the Antarctic" which gives a summarized version of all that was known of Antarctic weather behaviour at the time and was made available to researchers in the Antarctic and elsewhere at the start of the I G Y. The stimulus for the publication of this book was the results already obtained in the Department's Southern Hemisphere Research Project.

On ice

The South African research base SANAE (South African National Antarctic Expedition), is located on ice some 40 miles off the Antarctic mainland and is manned by fifteen scientists, three of whom are meteorologists. These men do a tour of duty lasting twelve months on a contract basis.

They take particulars of weather details at least eight times daily — sometimes in temperatures of -50 C and in windspeeds reaching up to 100 knots. Among the weather details measured are air temperature, pressure, turbulence, precipitation, wind and cloud formation.

A radio-sonde balloon being sent aloft by a member of the S.A. Weather Bureau. By means of these balloons, information on weather conditions in the upper atmosphere is obtained.

Measurements are made at two levels from the surface up to heights of about 16 miles. The details are obtained with the aid of hydrogen-filled balloons, attached to which are small radio transmitters. These send back signals which are decoded and plotted on graphs to indicate temperature, pressure, humidity and wind force and direction in relation to altitude. This information is then transmitted to the Weather Bureau of the Department of Transport at Pretoria, where it is collated with information collected from other weather services in the Southern Hemisphere as well as from South Africa's other weather stations in the southern Indian and Atlantic oceans, and is made available again to neighbouring countries. The World Meteorological Organization (W M O) plays an important part in co-ordinating and standardizing the making and dissemination of such observations.

Obligations

Research work done at SANAE also assists South Africa in fulfilling her obligations to W M O, as she has been allocated the entire area from the equator southwards between 15 W to 70 E, for which daily weather charts are being prepared.

Knowledge of the weather patterns and air circulation systems of the Antarctic has increased and South African weather men have contributed greatly to it. Research in the Antarctic will continue and, as it does, mankind will obtain a better understanding of the weather and we can anticipate a time when long range forecasting will benefit materially from such knowledge.

Food for future masses

IN contrast to the desolate continent of Antarctica, the Antarctic Ocean is rich in plant and animal life which ranges from minute organisms to the giant blue-fin whale which is the largest mammal in the world. Because of the abundance of organic life, the southern oceans could prove to be an important source of protein-rich food and research into this aspect by scientists of many nations has already yielded valuable information.

To date, very little is known about the Antarctic ocean. We know that the Antarctic Convergence, the area where the cold waters of the Antarctic meet the warmer waters of the Atlantic, Pacific and Indian Oceans, plays a very important role in the distribution of marine plant and animal life. Further knowledge of the exact nature of the convergence and the interaction and importance of the currents and temperatures is being sought.

The Scientific Committee for Antarctic Research

For many years scientists have recognised the significant contribution that polar research can make to man's knowledge of the earth as whole he lives. In 1882-83 an international scientific undertaking known as the First Polar Year was implemented and 11 nations sent expeditions to the Arctic. In 1932-33 there was a Second Polar Year, also focusing attention on the Arctic. Proposals in 1950 for a Third Polar Year gave birth to the idea of the International Geophysical Year (IGY) — a more wider international research programme but one which owed the increasing recognised scientific research in Antarctica as one of its main objectives.

It was realised, however, that the 18 months of the IGY would only allow for a superficial exploration of the vast area of Antarctica (5½ million square miles in summer and double that area in winter because of the ice which forms around the continent) and it was therefore recommended to the International Council of Scientific Unions (ICSU) that a permanent organisation to continue scientific research in Antarctica be formed. This led to the creation of the Scientific Committee for Antarctic Research (SCAR).

SCAR's headquarters are at the Scott Polar Research Institute in Cambridge, England. SCAR is composed of a number of working groups covering various fields of scientific research. These are biology; communications; geodesy and cartography; geology; geomagnetism; glaciology; logistics; meteorology; oceanography; solid earth geophysics, and upper atmosphere physics.

Twelve countries interested in Antarctic research have permanent delegates to SCAR — Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the United Kingdom, the United States of America and the USSR. The participating countries prepare annual reports for SCAR and delegates meet every two years to exchange information gained from research work in Antarctica and to make arrangements for future programmes. In addition, the observational or scientific data from all Antarctic stations are deposited in the established world data centres and are available to all on request.

The CSIR, through its Science Co-operation Division, adheres to SCAR on behalf of South Africa. The President of the CSIR, Dr S. M. Naudé, is chairman of the SA Scientific Committee for Antarctic Research. South African Antarctic research programmes and expeditions are administered by the SA Department of Transport on the advice of the Scientific Committee for Antarctic Research of the CSIR, and financed by a special fund allocated by the South African Government to Antarctic research.

AARDSKOKKE OP YSBANK GEREGISTREER

DY SANAE is daar vandag die enigste seismologiese sinsie in die wêreld waar aardskokke suksesvol op 'n drywende ysbank geregistreer word. Hierdie gestandaardiseerde seismograaf maak deel uit van 'n gekoördineerde wêreldwye netwerk van die Verenigde State se Coast and Geodetic Survey en is in 1964 by SANAE geïnstalleer.

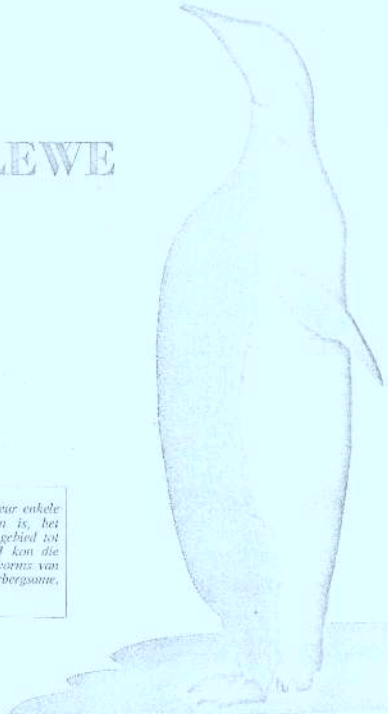
Aanvanklike probleme as gevolg van die onstabiele bodem sowel as knateling van die instrumentbasis op die onvaste sneeu en steurings as gevolg van windvibrasie op die gebou het veral die Langperiode-sisteem aanvanklik baie nadelig beïnvloed. Deur gedurige verstellinga en veranderings is die seismograwe egter by die ongewone omstandighede aangepas.

SANAE is veral goed gelê om skokke in die seismies-aktiewe Midde-Atlantiese Ruggebied te registreer. Daar is gedurende Maart verlede jaar byvoorbeeld reeds ses noemenswaardige skokke in die omgewing van Bouvet-eiland waargeneem.

Gedurende 1965 is daar in 'n periode van 8 maande sowat 190 aardskokke geregistreer. Hierdie skokke het voorgekom van Alaska tot in die Suid-Atlantiese gebied. Ook die kernbomontploffing, Operation Longshot (Oktober 1965), is duidelik op SANAE geregistreer.

STUDIE VAN LEWE IN DIE KOUE SUIDE

BEHALWE vir losstaande brokkies inligting wat deur enkele ontdekkingsreisigers en wetenskaplikes ingewin is, het Antarktika en sy satelliet-eilande ook op biologiese gebied tot onlangs toe onontdek gebly. Eers sedert die IGJ kon die wetenskap die sluier begin lig oor die verskillende vorms van lewe in die ydige Antarktika self en op die onherbergsame, windgeteisterde eilande rondom.



'n Statige keiserpikkewyn.

DIE geheime wat die groot yskontinent en die omliggende eilande so lank al ook op die gebied van die biologie bewaar, word tans stelselmatig deur die wetenskap ontrafel. Ook Suid-Afrika se wetenskaplikes is met hierdie verkenningswerk gemoeid. Op die vasteland van Antarktika self het die Republiek nog nie veel biologiese verkenning gedoen nie; 'n spesiale ekspedisie het egter in 1965/66 'n omvattende studie gaan maak van die verskillende vorms van lewe op die eilande Marion en Prins Edward en vroeg hierdie jaar is ook 'n oppervlakkige studie van Bouvet ondernoem. Die resultate van eersgenoemde ekspedisie wek reeds aansienlike belangstelling buite Suid-Afrika en word tans in samewerking met buitelandse deskundiges verwerk.

Marion en Prins Edward is tipiese sub-Antarktiese eilande, ongeveer 1,200 myl ten suide van Kaapstad gelee en net noord van die sogenaamde Antarktiese Konvergensiegebied waar die koue seewater rondom Antarktika met die warmer see se waters saamloop. Marion is sowat 150 vk myl groot en Prins Edward (twaalf myl noord-noordoos van Marion af) ongeveer 16 vk myl. Suid-

Afrika het hierdie twee eilande in 1948 amptelik geannekseer.

Die eilande is onderhewig aan 'n koel, stormagtige, seemikses klimaat. Oorheersende westewinde bring swaar reën- en sneeubuie — almal faktore wat die plantegroei geweldig beïnvloed — en die fauna en flora wat daar voorkom, is dan ook baie arm aan spesie maar tog merkwaardig vir hierdie breedtegraad.

Oorsprong

Wetenskaplikes gis lank reeds oor die oorsprong van plantegroei op afgesonderde eilande. 'n Teorie dat saad en spore oor lang afstande deur wind en trekvoëls versprei word, vind tans, bv. op grond van die resultate met die ringery van trekvoëls behaal, al hoe meer aanslag.

Die suksesvolle „immigrasie" van plante na eilande soos die sub-Antarktiese groep is egter baie moeilik aangesien nuwe aankomelinge uiters moeilike omgewingstoestande moet oorkom. Geen wonder dus nie dat slegs 23 spesies vatbundelflora (d.w.s. hoër ontwikkelde plante waarvan varings een van die eenvoudigste voorbeelde is) op Marion en Prins Edward voorkom nie. Slegs twee van hierdie plantsoorte is endemies aan dié eilande, m.a.w. hulle kom nie op ander sub-Antarktiese eilande ook voor nie.

Soorte

Die plantegroei op die Suid-Afrikaanse eilande bestaan uit 'n paar soorte grasse, varings en biesies, enkele blommende struik- en kruidsoorte en mosse. Oor die algemeen bestaan die plantegroei uit kussingagtige toendra-tipe plante en uit kruidplante, hoewel die kriptogame domineer, d.w.s. plante wat met spore, en nie saad nie, voortplant. Op die werklike Antarktiese eilande verder suid van die Antarktiese Konvergensie kom uiters min plante vanweë die koue voor en die meeste van hulle is dan ook kriptogame.

Die biologiese ekspedisie het op Marion 'n laboratorium ingerig en 15 maande lank daar onder moeilike omstandighede soos sneeustorms, digte mis, reën en stormwinde hul werk gedoen. Die ekspedisie se program het eerstens die versameling behels van verteenwoordigende monsters van al die plant- en diersoorte op die eiland. Monsters is versamel van die paar blommende plante en varings, die talryke mossoorte, lewer- en korsmosse, see- en varswateralge, swamme en andere, asook van die ongewerwelde land- en seediere ensovoorts.

Nog 'n belangrike aspek van die biologiese program was om 'n studie te maak van die plantgemeenskappe en hul mikroklimaats- en chemiese omgewings. Die uitloogeffek van reënwater op sekere plantgemeenskappe, die invloed van onafgebroke soutstuifsel op die plante langs die kuste of van die gekonsentreerde chemiese inwerking van pikkewyn- of robmis op plante in die omgewings van broeiplekke is maar 'n paar voorbeelde van wat bestudeer is.

Talle faktore wat ekologies op plantegroei inwerk, bv. ryp, windkragte, afsondering en blootstelling kan op hierdie eilande onder ideale toestande bestudeer word. Die windgeteisterde hoë luwariuwwe, die moerasse, die gehiede wat met eilandgrond bedek is, die hoë, blootgestelde klippieshellings waar die skaars plante onder luwabrokke skuil — dié is almal voorbeelde van die verskeidenheid plantgroeiplekke wat vir die bioloog besonder interessant is.

So lyk Marion-eiland van die see a duid

'n Ander belangrike gedeelte van die biologiese program was die studie van die plant- en klimaatsgeskiedenis van die eilande. Met hierdie doel voor oë het wetenskaplikes bv. vanaf aluminiumplatforms op die sagte moerasveen kern uitgeboor wat gebruik is vir die ontleding van gefossileerde stuifmeel en spore en vir ouderdomsbepalings met behulp van radiokoolstoftegnieke. Hierdie werk het reeds hoelwat inligting opgelewer aangaande die ouderdom van dié twee vulkaniese eilande, hul klimaat in vroeër eeue, die aanvang van plante- en dierelewe daarop en allerlei ander onderwerpe.

Die voëls

Die voëlbevolking van die twee eilande saam slaan mens se asem skoon weg. Letterlik tienduisende pikkewyne, seemeeue, albatrosse, seeswaels en ander voëls lewe van die produkte wat die ryk suidsee oplewer en illustreer die tussenverband van die eilande se ekosisteel met dié van die see. Die voëls oefen 'n groot invloed uit op die eilande se plantgemeenskappe en die voortplanting daarvan, en ook op die gronderosieproses.

Altesaam 34 soorte voëls (merendeels seevoëls), is op die eilande opgemerk. Van hulle broei 25 soorte op die eilande. Die ornitoloog wat

'n See-olifant lê lui-lekker in die sa Marion-eiland. Kalfies weeg by geb sowat 80lb. Na slegs 23 dae weeg gewig toe tot ongeveer 450lb

Geboue van die weerkundestasie is tar.

die ekspedisie meegemaak het, het 'n aantal van die voëls se broeiplekke en gewoontes noukeurig bestudeer en interessante gegewens aan die lig g ng.

Die meeste van die voëls (21 van die 25 soorte) lewe geheel en al van vis en ander seevoedsel, drie soorte lewe gedeeltelik van seekoskse en gedeeltelik van insekte en plantmateriaal terwyl net die klein yshoendertjie sy kos slegs op land soek. Laasgenoemde voëlsoort verwissel sy somerdieet van pikkewyneiers en -kuikens, dooie voëltjies, robkleintjies en -afval in die winter vir 'n maaltyd van erdwurms en insekte wat in groot getalle onder die mostapyt oor die moerasse voorkom.

Twee soorte eilandvoëls — die Gentoo-pikkewyn en die swart-albatros — se gedrag, hofmaakgewoontes, nesboumetodes en aktiwiteite in die broeiplekke dwarsdeur die dag is in fyn besonderhede bestudeer. Ook is digby 'n ^risend albatrosse en reuse stormve.. met beenringe gering asook meer as 'n honderd skuas, sodat hul trekgewoontes bestudeer kan word. Daar kan nog baie navorsing oor bv. die lewenswyse van die voëls en die parasiete en siektes waaraan hulle onderhewig is, gedoen word.

Insekte en goggas

Gedurende veldwerktogte het die lede van die ekspedisie ook gereeld aandag geskenk aan die voorkoms van insekte, wurms, spinnekoppe en myte. Laasgenoemde klein goggatjies lewe veral onder lawaskerwe waar die mikroklimaat veel gunstiger is as buitekant. 'n Paar honderd monsters is versamel vir verdere studie.

Die ekspedisielede het ook heelwat tyd aan algemene soölogiese studies, veral van die robbevolking van die eiland, bestee. Die gedrag van die twee soorte robbe op die eilande—die pelsrob en die see-olifant — is noukeurig bestudeer terwyl die wyfies in honderdtalle op die strande aangekom het om te kalf en gedurende die daaropvolgende paar maande is heelwat kennis van hierdie robbe ingewin. Die wyfies verhaar bv. in Januarie en Februarie, gaan dan vort die see in en keer nie weer terug voor Oktobermaand vir die volgende kalfseisoen nie. Die bulle verhaar eers in Maart en April.

Moordvis

Slegs een ander soogdier is deur die ekspedisie opgemerk, nl. die moordvis of „killer whale" wat meer kere tydens die robbe se kalfseisoen en die verhaarperiode van die wyfies rondom die eilande op strooptogte opgedaag het as gedurende die res van die jaar.

Bouvet en Antarktika

Vroeg in hierdie jaar het die Departement van Vervoer ook 'n Suid-Afrikaanse ekspedisie na Bouveteiland, wat aan Noorweë behoort, gereël. Die doel van die ekspedisie was om die moontlikheid te gaan ondersoek om 'n weerstasie daar op te rig, en terselfdertyd het 'n aantal wetenskaplikes die geleentheid gekry om 'n vlugtige biologiese ondersoek van die eiland te maak.

Vanweë sy posisie na aan die poolse ysfront is die eiland byna geheel met ys bedek en kom daar geen vaskulêre plante voor nie. Slegs 'n aantal voorbeelde van verskillende mossoorte, alge en seeplankton kon versamel word. 'n Klein klompie wurms, myte en uiters interessante seediertjies is

Cat and mouse

MICE were accidentally introduced onto Marion Island, but as far as can be ascertained, do not cause much damage to plant and animal life. Cats were later imported in an effort to eradicate the mice. Experience has shown that instead, the cats take a heavy toll of bird life, particularly the smaller species.

gevang, asook 'n witbloedige vis. Ook Bouvet word deur groot kolonies pikkewyne en ander seevoëls en deur robbe bewoon. 'n Interessante waarneming wat lede van die ekspedisie gemaak het, was dat daar op die strande self geen teken van lewe gevind kon word nie; nie eers van uitgespoelde seelewe nie.

Lewe op die vasteland van Antarktika self is maar skraal. Voëls en seediere kom eintlik net om die kus van die kontinent voor, terwyl maar sowat 300 soorte mosse nog daar opgeteken is en vyf sighaar bloeiende plantsoorte, waarvan twee inheems aan Antarktika is. Hierdie plante kom meestal net voor op die bergpieke en -hange wat bo die yskap uitsteek en waarop die wind pikkewynkwano laat neerstuif sodat dié gedeeltes vrugbaar is vir plantegroei. Antarktika se enigste twee blomplantsoorte groei op die westelike gedeelte van die skiereiland, waar die temperatuur en die vogneerslag hoër en dus gunstiger is as elders. Die droogte, snerpende koue, die afgesonderdheid van die kontinent, uiterste temperatuurskommelinge binne kort tydperke en die sterk winde wat groot hoeveelhede sneeu voor hulle uitjaag, is almal faktore wat plantegroei op Antarktika byna onmoontlik maak.

Antarktika se plantegroei bestaan meestal uit mosse. Hier groei 'n paar op 'n rots.

Probing the upper atmosphere

OUT over the South Atlantic Ocean between South Africa, Antarctica and South America, electrons and protons (which are the electrically charged building blocks of matter) coming from the Van Allen Radiation Belts surrounding the earth, plunge closer to the planet's surface than anywhere else. The reason why they do so is because over this region, there is an unexplained weakness or anomaly in the earth's magnetic field. The fact that particles from the Van Allen Belts penetrated deeper into the atmosphere in this region than elsewhere, had been guessed at by Russian and American scientists who had conducted electron counts from space by means of satellites.

But it took a team of South African scientists, headed by Professor J. A. Gledhill of Rhodes University, after an astonishing feat of scientific research and detection, to prove the facts. They were able to do it because the South African National Antarctic Expedition's base in lonely Queen Maud Land is in a unique situation — it is located within the magnetic anomaly area and is ideally situated for studying the effects produced by particles from outer space penetrating deep into the atmosphere.

Nobody knew this back in 1962 *when Rhodes University's Department of Physics under Professor Gledhill, sent an observer to SANAE to take ionospheric measurements. Similar measurements had been taken at other stations operating in Antarctica during the International Geophysical Year without startling results. Some interesting peculiarities had been observed — but nothing which was gauged to be of first-rate importance.*

In fact, everyone thought that the ionosphere over Antarctica was the same as the ionosphere everywhere else.

THE ionosphere is important because it reflects radio waves back to the ground instead of letting them escape into space. Thus it makes long distance radio communication possible. It does this because it contains myriads of electrons. In the ionosphere, the electrons are not all bound to atoms as they are in most types of matter. Some of them are separated from atoms by ultra-violet light from the sun during the day-time. During the night they re-combine to form atoms again, but they do it so slowly that many are left free even just before the dawn of the next day.

It is the presence of these "free" electrons which makes the ionosphere a good reflector of radio waves.

Few free electrons are found in the atmosphere until a height of 60 miles is reached because the sun's ultra-violet rays do not penetrate much deeper than this. The atmosphere between 60 and 80 miles up is known as the E Layer and electrons are found there. Above 140 miles is found the densest layer of electrons of all, known as the F2 Layer.

Maximum

The electron density reaches a maximum at about 200 miles from the planet's surface. At greater distances the concentration declines continually until the atmosphere thins out into empty space.

All this is known because radio waves of various lengths can be reflected off the electrons and returned to earth, which allows their density and distance to be computed. Automatic devices which perform this function at intervals, usually every 15 minutes, are available and are known as ionosondes.

An ionosonde was installed at SANAE with the 1962 Antarctic Expedition and it was not long before regular reports on ionospheric conditions were being received at Grahamstown. Soon, enough data was available to publish a bulletin which was distributed to countries all over the world including Britain, the USA, Australia, Japan, South America and Russia.

Record

Since then, a constant flow of data has been maintained and according to Mr. Hannes la Grange, leader of the first South African Antarctic Expedition, this and subsequent bulletins constituted the fastest publication of Antarctic data known — a record still held by SANAE.

Even with all this activity at SANAE, all that might have been produced was another pile of data had it not been for another South African scientist who went to a cosmic ray conference in Japan in September, 1961. He was Professor Pieter Stoker, Professor of Physics at Potchefstroom University, who listened to a paper presented by a group of Russians headed by Professor Ginzburg, and brought a copy back to South Africa and Professor Gledhill.

It had been suspected, ever since their discovery in 1958 by Professor James Van Allen, that the particles in the radiation belts surrounding the earth must come closest to the surface over the South Atlantic Ocean.

Electrons and protons are trapped in the earth's magnetic field to make up the belts, and perform a complicated type of motion around the globe. There are two radiation belts, the inner one about 1,000 miles and the outer one at a height of about 16,000 miles above the equator.

It was expected that these particles would approach closest to the earth in the South Atlantic region because of the magnetic anomaly which exists there.

Unique position

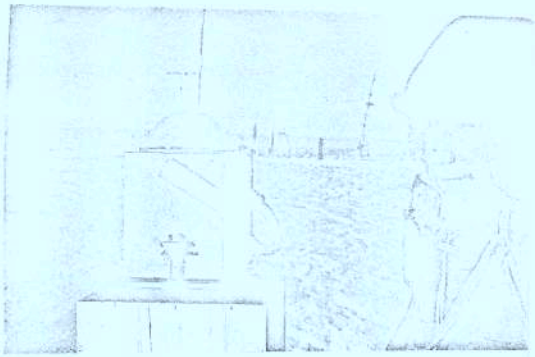
By using satellites, Ginzburg and his colleagues had discovered that particles really did come close to the earth over this region. The place where the inner belt of particles did this was just east of Rio de Janeiro. But the place where the outer belt did it was only about a quarter of the way from SANAE to Cape Town. At this point the satellites had recorded a sudden increase in the counting rates of electron sensors carried on board — indicating some form of "sinkhole" in the sky into which the radiation particles were raining.

His interest stimulated, Professor Gledhill obtained maps of satellite observations — and he found that one of the major "sinkholes" in the earth's magnetic field was almost directly over SANAE. South Africa was suddenly in a unique position to study the effects produced by incoming particles.

Professor Gledhill and one of his research students, Mr P. van Rooyen, decided on a theoretical basis that the effects would be the emission of a faint light ("airglow") by the oxygen atoms in the upper air and of ultra-violet rays by nitrogen molecules. It also seemed possible that the particle bombardment from space would heat up the ionosphere considerably, and decrease the electron concentration while increasing the height of the F2 layer. This is how they launched out on a difficult road of scientific discovery.

Bombardment

In 1964, it was thought enough data had been accumulated from SANAE to look for the predicted effects of the particle bombardment. But the results were discouraging. Nothing could be found which really looked like the expected changes in the atmosphere. One of the main difficulties was that the scientists had no proof as to whether there was a heavy or light bombardment by particles at any particular time.



A member of SANAE standing next to a radiation recorder. This instrument is used for recording the daily totals of radiation from the sun and sky.

Breakthrough

A breakthrough came when the Rhodes University group asked other scientific workers in the world for satellite particle counter results — and found their answers in a wad of computer-printed figures sent to Grahamstown by a Canadian. They had been obtained from a satellite known as Alouette.

Alouette did not observe particles in the SANAE area directly — but it did so at the other end of the line of force of the earth's magnetic field which runs through SANAE. This "conjugate area" is in the North Atlantic between Newfoundland, Greenland and Iceland.

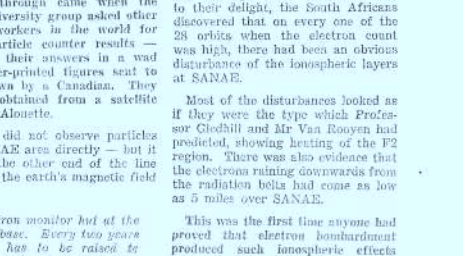
The Rhodes University scientists counted all the occasions when the satellite had passed through the area. There were 77 such occasions and on 38 of these, the number of electrons counted each second was obviously large. On the remaining 49 orbits it was small.

Now they knew how to interpret the findings from Antarctica and to their delight, the South Africans discovered that on every one of the 28 orbits when the electron count was high, there had been an obvious disturbance of the ionospheric layers at SANAE.

Most of the disturbances looked as if they were the type which Professor Gledhill and Mr Van Rooyen had predicted, showing heating of the F2 region. There was also evidence that the electrons raining downwards from the radiation belts had come as low as 5 miles over SANAE.

This was the first time anyone had proved that electron bombardment produced such ionospheric effects except during aurorae.

The neutron monitor hut at the SANAE base. Every two years the hut has to be raised to compensate for the precipitation of snow.



A paper was prepared on the subject and presented in May, 1965 at an International Space Science Symposium in Argentina — and the scientific world was alerted to the fact that South Africa was working on something important.

Space puzzle

During 1965, the research group started to put together the pieces of the space puzzle. It was able to show that ionospheric disturbances similar to those at SANAE occurred at other places beneath the radiation belt also. These included Campbell Island south of New Zealand; Hulley Bay, not far from SANAE; Winnipeg, Ottawa and St. John's, Canada.

In every case when the satellite Alouette observed electrons being precipitated at one of these places, an ionospheric disturbance was in progress. The disturbances were much less frequent at the other places because they were far from the magnetic anomaly. But when they did occur they were unmistakable.

Ever since the ionosphere had been studied systematically, it had been observed that while the E and F1 layers were predictable in their behaviour, changing in a regular manner each day, the F2 layer was quite different.

Electrons

On one day it would build up an enormous concentration of electrons about noon. On the next, it would have few, perhaps reaching a maximum before 10 a.m. and then falling off again or building up much more slowly than usual and then suddenly increasing in electron concentration towards evening.

Some days it would have its greatest concentration of electrons at a height of 180 miles and at 300 miles the next. The electron concentration also varied from hour to hour. Many explanations had been offered but none had gained general acceptance.

The Rhodes research group asked themselves if the erratic behaviour was caused by electrons being dumped into the F2 region from the Van Allen Belts. This was a difficult question to answer because the group did not have a satellite overhead to watch for incoming electrons. Nor did it have sounding rockets to fire to 100 miles altitude to look for bombarding electrons every time the ionosonde started recording.

So two of the group, Marsha Harding and Douglas Torr, took readings for random two-hour periods from various ionosphere stations and classified them as "disturbed" or "quiet" in the light of the knowledge they had gained from the earlier studies. After working out for each station the percentage of the total time for which the ionosphere was disturbed, they looked up from the Alouette recordings the percentage of the total time for which the number of electrons precipitated per second at each station exceeded the limits, known from the preliminary study to produce a disturbance.

The result was an astonishing victory for scientific detective work.

In every case the two figures were exceedingly close to each other. There could be little doubt that electron bombardment did take place exactly often enough to account for the disturbances.

The Rhodes researchers are busy putting their findings on paper and are confident it will prove to be the key to the puzzle of the odd behaviour of the F2 region. And it was all possible thanks to SANAE.

Marsha Harding went on to show that the electron population observed in the outer radiation belt by various satellites could be accounted for if there was a constant leakage of electrons from outer space into the belt all the way around the earth. The theory is simple to work with and seems to give better answers than more complicated ones worked out by others. Time will tell.

Other South African scientists are also working on the problems involved.

Airborne research

Professor Stoker who sparked off the research programme when he brought back the first clues from Japan, has twice flown in an aircraft deep into the South Atlantic, across the region of the magnetic anomaly, to take direct readings of electron and proton precipitation. On both occasions he was accompanied by Professor P. Zeeman of Stellenbosch University whose responsibility was to observe the predicted airglow phenomena.

On the first occasion they did so late in 1964, there were few magnetic disturbances and precipitation effect were observed. Subsequently a pape on the subject was read by Professo Stoker at an international spac science symposium in Argentina las year.

The flights were repeated in Augus 1965, with much better scientifi equipment and the results are sti being processed. On this occasion, th magnetic field was very quiet, but th measurements taken will provide a excellent background for the precip tation effects observed during the 196 flights.

NOT THE LAST WORD

DESPITE all the research work at SANAE, the last word on cosmic ray penetration there has still to be spoken. This is because since 1964, the Potchefstroom University Group has been continuously monitoring cosmic radio noises of 30 megacycles (or megahertz) with a RIOMETER (relative ionospheric opaque meter) at SANAE.

Their results do not show the same high rate of disturbance found with an ionosonde by the Rhodes Group.

In fact, the absorption of cosmic noise by the ionosphere over SANAE appears to be quite normal when compared with Alaskan observations in the northern aurora, says Professor Stoker.

One Potchefstroom worker, Mr Deon Kuin, could even deduce the position of SANAE in the aurora absorption belt.

Professor Stoker said there was no indication of any enhanced absorbtion at SANAE. This was contrary to the observations of the Rhodes Group and the explanation still had to be found.

Argief in die ys

–Gletserkundiges ontrafel geheime

DIE Antarktiese ys speel 'n sleutelrol in die aarde se warmtebalans. Dit beïnvloed die waat van oseane en lande na die noorde — veral onder Suid-Afrika. Die presiese omvang van hierdie invloed moet nog bepaal word, maar dit is bekend dat koue lug afkomstig van Antarktika die ander landmassas van die suidelike halfrond wel bereik. Gesmelte ys van die Antarktiese oseaan beïnvloed die aangrensende seegebied vir honderde myle in alle rigtings en die vriesing van oppervlakwater dra by tot die vorming van onderstrome en koue lae ver noord van die Antarktiese Konvergensie.

Rand van die Antarktiese yskap. Die mens op die voorgrond staan op die bevrore see.

GLETSERKUNDIGE NAVORSING in Antarktika behels eerstens die geografiese beskrywing van die yskap: bv. die buitelyn van Antarktika en die ysbanke; bepaling van die topografie en hoogte bo seespieël; lokalisasie van individuele landmerke van die yskap en die ysbanke; dikte van die ysmassa; lokalisasie en beskrywing van ysvrye gebiede en die topografie van die landmassa onder die ys.

Tweedens is gletserkundige navorsing gemoeid met die massa-balans van die ys. Belangrike vrae wat in hierdie verband beantwoord moet word, is onder meer of die ysbedekking krimp of groei in ooreenstemming met klimaatverandering — of die reaksies vertraag is of nie — en of dit tans besig is om te krimp of te groei.

Derdens word die vloei van die yslaag en van gletsers bestudeer.

Die geskiedenis van die Antarktiese yskap is ook van belang. Laasgenoemde behels 'n studie van die sneeulae en onderliggende ys deur middel van putte en boorgate. In hierdie verband is dit onder meer van belang om te weet of die Antarktiese ysbedekking in ooreenstemming met die ystydperke van die noorde gefluktueer het.

Rekord van verlede

Die yskern wat uitgeboor word, gee 'n rekord van alle gletserkundige en geofisiese gebeurtenisse oor die afgelope duisende jare. Die Amerikaners hoop byvoorbeeld om by die suidpool en in Marie Byrdiland met boorgate dwarsdeur die yskap kern te verkry wat buite 'n blik op die Antarktiese geskiedenis so ver na 10,000 tot 15,000 jaar terug sal gee. Mikroskopiese organiese en anorganiese partikels wat in die ys vasgevang is, sluit onder meer kosmiese stralingsdeeltjies, mikrometeoriete, vulkaniese as en mensgemaakte besoedelingstowwe in.

As 'n siklus van kosmiese straling uit die stralingsdeeltjies in die yskerne afgelei kan word, sou dit byvoorbeeld moontlik wees om te voorspel wanneer stralingstoestande ruimtevaart op 'n bepaalde tydstip te wagte kan wees.

Suid-Afrikaanse gletserkundige navorsing, hoewel beperk in omvang, lewer bydraes tot al vier bogenoemde afdelings. Gletserkundige waarnemings word gedoen in 'n belangrike dreineringsgebied wat strek vanaf die Koningin Maudlandplato, al langs die

Die Taylor-gletser in Suid-Victorialand—een van die grootste gletsers in die wêreld.

sogenaamde Penckaökka - Jutulstraumen - Fimbul-ysbank - Trolltungavloeilyn (sien skets). Dit sluit dus in kontinentale ysplaat, skarniergebied en drywende ysplaat — 'n klassieke gletserkundige studiegebied. Slegs 'n paar voorbeelde van die gletserkundige werk by SANAE word hier gegee.

By SANAE word sedert 1962 'n gekoördineerde program van massabalansstudie uitgevoer wat in oorleg met aanbevelings van die gletserkundige werkprogram van die Wetenskaplike Komitee vir Antarktiese Navorsing (SCAR) opgestel is.

Die doel van hierdie massabalansstudie is om vas te stel wat die verhouding is tussen die hoeveelheid ys wat versamel (akkumulasie) en die hoeveelheid wat verlore gaan (ablasie). 'n Surplus van akkumulasie oor ablasie dui op 'n toename in ysvolume en andersom.

SA se studiegebied

Direkte metings van sneeu-akkumulasie word nou al vir 8 tot 9 jaar gedoen. Daar is reeds sowat 200 waarnemingspunte op die Fimbulysbank en in SANAE se kontinentale hinterland. Die ongeveer 3,000 kontinue sneeuvalmetings wat oor hierdie tyd versamel is, is waarskynlik die volledigste neerslagrekord in Antarktika.

Berekening van sneeuval

In die poolgebied is die versakking van die oorspronklike sagte sneeu — as gevolg van sterk winde en van gravitasie — heeltemal voldoende om die sneeu in digte ys te verander. By SANAE, in teenstelling met die grootste gedeelte van die hoogliggende en baie koue poolplato, vind daar as gevolg van hoë lugtemperature en sterk radiasie in die somer ook nog smelting plaas met die gevolg dat water van die oppervlak in die sneeu afsyfer om laer af waar temperature onder vriespunt heers, weer te verys. Om 'n vergelyking tussen die verskillende soorte sneeu en ys moontlik te maak, word sneeu-akkumulasie uitgedruk in terme van ekwivalente hoeveelhede water, m.a.w. die dikte van die sneeulaag word met die gemiddelde digtheid daarvan vermenigvuldig.

Diep put

Benewens hierdie akkumulasiewaarnemings word daar ook stratigrafiese studies van die sneeulae gemaak, om vas te stel wat die gemiddelde akkumulasie oor verskeie jare is. In 1962 is daar byvoorbeeld deur middel van 'n diep put en 'n verdere spiraalboorgat 'n sneeuprofiel van 106 vt. by SANAE opgemeet. Die neerslag van opeenvolgende seisoene is uitgeken aan die veranderings in korrelgrootte, digtheid en hoeveelheid smelting. (Dit kan ook deur middel van stabiele isotoopwaarnemings gedoen word.) Daarvolgens het dié betrokke profiel gestrek oor 'n tydperk van 52 jaar — dus sover terug as 1910. Volgens berekening was die gemiddelde jaarlikse akkumulasie gelykstaande aan 40 cm. water. Vergelykbare akkumulasiewaardes is deur Engelse en Belgiese navorsers met dieselfde metode by ander basisse op die ysbanke van Koningin Maudland gekry. Die gemiddelde neerslag vir die hele kontinent word as 15 ± 3 cm water aangegee.

Antarktika raak van sy oortollige ys hoofsaaklik ontslae deur middel van gletsers en ysriviere wat uiteindelik in die see uitmond. By

Sal al die ys smelt . . .

DIE Antarktiese yskap bevat minstens 90% van die aarde se landelike ys — dit strek oor 95% van die kontinent en tot ver in die see en bedek 'n oppervlakte 11 keer so groot as die Republiek van Suid-Afrika. Die yslaag is gemiddelde 7,000 vt. dik — die dikste meting tot dusver is 14,500 vt. — en die totale volume word op ±7 miljoen kubieke myl bereken.

Die stabiliteit van die Antarktiese yskap is die grootste enkele faktor wat die watervlak van die oseane beïnvloed. Die smelting van slegs 'n klein persentasie van hierdie ys sou die seevlak aansienlik laat styg. As ál die ys smelt, sal dit na skatting die seevlak met 250 vt. laat styg — en kusstede en laagliggende gebiede grootliks oorstroom.

SANAE word 'n langtermynprogram van hulpkartografie vir gletserkundige uitgevoer. 'n Vervormingsnetwerk is uitgemeet en die resultate van relatiewe oppervlakvervorming en absolute beweging sal binnekort bekend wees. (Sien ook bl. 20).

Dit is vir die gletserkundige veral van belang om te weet hoeveel ys binne 'n gegewe tyd deur 'n gegewe dwarssnit vloei. Die geïndiseë waarnemingsroetes wat 'n uitgebreide netwerk op die Fimbul-ysbank vorm en tot sover na 72°S strek, is dus so beplan dat dit moontlik sal wees om ysdiktes langs 'n bepaalde profiel en langs tussen-nunataklyne te bereken.

Die tempo en hoeveelheid van die ysverlies as gevolg van smelting aan die bodem van 'n drywende ysbank, soos die Fimbul waarop SANAE gelee is, word indirek bepaal deur nivellering langs roetes te herhaal. Die resultate van hierdie werk by SANAE is nog nie beskikbaar nie.

Hoewel gravitasiemetodes van ysdiktebepaling nie so akkuraat is as seismiese pellings nie, word eersgenoemde metode tans meestal by SANAE gebruik. Die sogenaamde radar-eggopeiltoestel wat die afgelope jare ontwikkel is, is egter heelwat akkurater (5 m) as seismiese pellings (15 m) en kos ook slegs

Ysbank beweeg saam met getye

SOOS die getye kom en gaan, word die drywende ysbank waarop SANAE-basis staan gedurigdeur opgelig en neergelaat. Twee lede van die Suid-Afrikaanse Antarktiese Ekspedisie van 1965 het met behulp van 'n gravimeter wat spesiaal vir die doel aangepas moes word, bereken dat die ysbank met die getye tussen 28 en 66 dm op en af beweeg. Hierdie beweging veroorsaak dat die ys diep skeure vorm in die gebied waar die vasteland begin. Wanneer ekspedisies die binneland intrek, vorm hierdie yssplete, wat soms toegesneeu en dus onsigbaar is, 'n wesenlike gevaar.

Unique opportunities for medical research

AN Antarctic expedition provides a unique opportunity for carrying out research in medicine, physiology and psychology. In addition research associated specifically with the Antarctic climate and environment, studies can be made of a group isolated from all other human contact for a prolonged period. The group has a uniform diet, lives under regular physical conditions where there is a relatively uniform climate indoors and, out-of-doors exposure to cold is intermittent. In such a homogeneous group with a uniform way of life, free from all outside influences, important work can be carried out, especially in the physiological and psychological fields of medicine. The length of the period over which such studies can be made — usually at least a year — means that results are far more truly representative than those obtained in short-term experiments elsewhere.

The importance of a co-ordinated international programme in which all the SCAR nations participate is that by making the same type of tests simultaneously in various parts of Antarctica, not only are the subjects in an experimental group increased but comparisons can be made of variations occurring in different areas and among men of different nations accustomed to different climates and living conditions in their home countries.

A medical research programme has been drawn up by the Biology Working Group of SCAR which all participating nations have been asked to adopt. South Africa's contribution to this programme will be supervised by the Human Sciences Laboratory of the Chamber of Mines. The programme includes a study of the environmental conditions to which members of Antarctic expeditions and bases are exposed, together with as detailed a study as possible of their physical activities, the clothing worn, sleep periods and other relevant data. Regular measurements will also be made of body weights and skinfold thicknesses. Standard procedures for these assessments and measurements have been drawn up by the Biology Working Group.

Apart from this work, SCAR nations are free to follow any other line of medical research in which they may be interested and for which they are equipped. Specific South African research programmes will be carried out by the S A Institute for Medical Research, the Human Sciences Laboratory of the Chamber of Mines, the CSIR's National Nutrition Research Institute and National Institute for Personnel Research and the Department of Physiology, University of Pretoria.

sowat R6,000 teenoor ongeveer R30,000 vir seismiese toerusting. Hierdie metode is dus die mees gewenste oplossing vir ysdiktebepalings.

Delikate instrument

Tot dusver doen Suid-Afrikaanse ekspedisies nog hul metings met 'n gravimeter deur die vloer van 'n kaboca of veldkombuisslee waarmee die veldtogte onderneem word. Deur die ongunstige toestande van temperature onder vriespunt, wind en jagsneeu uit te skakel, word dié delikate geofisiese instrument ten beste benut. Totale magnetiese veldsterkte word met 'n protonpresisiemagnetometer gemeem wat gou en akkurate lesings kan registreer.

Die maksimum dikte van die Fimbul-ysbank kan 700 m of meer wees, in teenstelling met die grootste drywende ysdikte van 1,320 m wat op die Filchner-ysbank gemeet is.

Die verwerking van die resultate van hierdie navorsing — trouens dié van alle aardkundige navorsing — word in die publikasiereeks van die Suid-Afrikaanse Geologiese Opname en ook in ander wetenskaplike tydskrifte gepubliseer. Saam met die werk van die ander Antarktiese Verdragstate — almal onder die beskerming van SCAR — lewer Suid-Afrikaanse aardkundiges op internasionale vlak 'n belangrike wetenskaplike bydrae.

Die geologie van die Yskontinent

WESTELIKE Koningin Maudland, gelee reg suid van die Suid-Afrikaanse basis, SANAE, is een van die gebiede van die aardoppervlakte wat vir vandag se geoloë 'n uitdaging inhou.

'n Geologiese rotaformasie in Antarktika.

DAAR is verskeie redes waarom geologiese navorsers dit tóg die moeite werd ag om veldwerk te doen in hierdie onherbergsame kontinent.

Eerstens is Antarktika die enigste kontinent waarvan die natuurlike hulpbronne nog onbekend en onontgin is. Voordat dié land geologies en geofisies volledig ondersoek is, kan niemand seker wees van watter ekonomiese moontlikhede Antarktika inhou nie.

Hoewel steenkool skynbaar vry algemeen aangetref word en beskou word as Antarktika se vernaamste natuurlike hulpbron, kan die voorkoms daarvan tot dusver met geen akkuraatheid aangetoon word nie.

Suid-Afrikaanse geoloë het ook aanduidings van kopermineralisasie onlangs in die Ahlmannberge gevind (sien kaart op bl. 19). Sedimentêre koperertse wat hoofsaaklik in die basale gedeelte van die gesteentoppeenvolging aangetref word, sal gedurende die komende somer van 1966/67 vir meer uitgebreide ondersoek en bemonstering gebruik word.

Die aanwesigheid van 'n groot aantal ander bruikbare minerale is ook in Antarktika vasgestel. Die enorme probleme wat die ontginning, voorbereiding en vervoer van minerale in Antarktiese toestande sal bied, beperk egter die potensiële ekonomiese ertsafsettings tot dié edele metale en edelgesteentes met 'n hoë waarde-tot-massa-verhouding. Selfs dan moet die gemiddelde metaalgehalte van die erts baie na aan sy teoretiese maksimum-inhoud wees om ekonomiese produksie moontlik te maak.

Die tweede rede vir die geologiese belangstelling is dat navorsers hoop om in Antarktika die antwoorde te kry op sommige onopgeloste vraagstukke in verband met die geskiedenis van die aarde.

Geologiese kartering van Antarktika is uiters moeilik omdat die grootste gedeelte van die landoppervlakte (95%) onder 'n permanente yskap bedek is. Geloë is dus hoofsaaklik beperk tot die nunataks of bergspitse wat plek-plek bo die sneeu uitsteek.

Uit die gegewens wat deur geloë van al die Antarktiese Verdragslande ingesamel is, kan daar egter 'n breë beeld van die geologie onder die yskap opgebou word. Daar is onder meer vasgestel dat Antarktika een land is met twee duidelike landmassas, naamlik die kontinentale plato van Oos-Antarktika, en Wes-Antarktika wat bestaan uit die ploolingsgebergte van die Antarktiese skiereiland en Marie Byrdland. Die ploolingsgebergte van die skiereiland (wat tot in Byrdland mag loop) word beskou as 'n voortsetting van die Andiese gebergte van Suid-Amerika en van die Scotiaboog.

'n Belangrike probleem vir die Antarktiese geologie is die verloop van hierdie „Antarktandes" ten suide van die Antarktiese skiereiland. Nog 'n faset van hierdie algemene probleem is: Wat is die aard van die grens tussen Oos- en Wes-Antarktika?

'n Geotektoniese probleem van groot belang is die ouderdom van Antarktika as 'n afsonderlike kontinent. Die antwoord op hierdie vraag

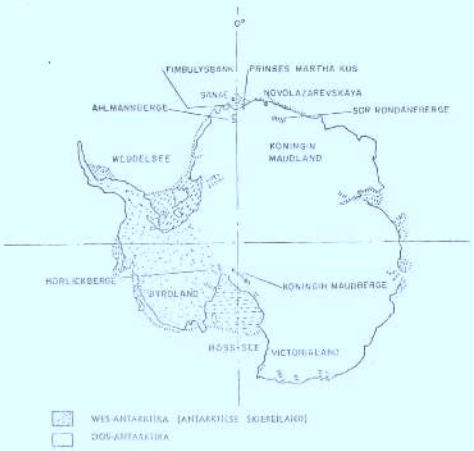
is van groot belang vir die bevestiging — of verwerping — van die teorie van kontinentskuiwing, naamlik dat Indië en die kontinente van die Suidelike Halfrond oorspronklik een groot land, Gondwanaland, was.

Die gesteentes van Antarktika behoort baie waardevolle inligting te verskaf oor die paleogeografie van die verlede en oor die aarde se klimaat gedurende resente geologiese tye. Teorieë oor die aarde se klimaatsgeskiedenis soos die voorkoms van wêreldwye klimaatskommelings; die verskuiwing van die geografiese pole (en weer eens kontinentsverskuiwing) mag deur hierdie inligting bewys of weerlê word. Die geologiese geskiedenis van Antarktika, die enigste poollandmassa, soos dit van die fossielfauna en -flora afgelei kan word, sal baie bydra tot die opheldering van die wêreldwye patroon van klimaatsverandering.

Geen fossiele nie

Suid-Afrikaanse geoloë het tot dusver in die sedimente van die Ahlmannberge waar hulle werksaam is, geen fossiele gevind wat 'n aanduiding van die ouderdom van die gesteentes kan gee nie. Na analisering onder andere van die laat-Prekambriese alge wat deur Russiese ekspedisies in soortgelyke sedimente uitgeken is, word die Ahlmannformasie egter tentatief as laat-Prekambries of vroeg-Paleosoïes (ongeveer 600 miljoen jaare in ouderdom beskou. 'n Bemonsteringsprogram vir geochronologiese bepalings is ontanks volloot en die resultate hiervan behoort heelwat lig op die ouderdom van hierdie gesteentes te werp.

'n Besonder belangrike deel van die algemene probleem van klimaatsverandering is natuurlik die ouderdom—en oorsprong van die yskap. Wanneer het die yskap begin vorm? As dit reeds gedurende die Pleistoseen



bestaan het, het dit dan gelyktydig met die yslae in die Noordelike Halfrond fluktuasies ondergaan?

Daar is baie bewyse dat Antarktika deur die yslang wat gemiddeld 7,000 vt dik is, in die onderliggende rotsmassa afgedruk word, bygevolglik die feit dat groot dele van die rotsfondament onder seespieël lê en die abnormale diepte van die kontinentale plat. Gletsersdrupe op die spitse van nunataks dui daarop dat die yslaag nou op 'n laer vlak is as voorheen, m.a.w. dat die ys verminder het.

Op hul beurt dui die aanwesigheid van gewese strande ver bokant die hoogwaterlyn in sekere kusstreke daarop dat die kors besig is om terug te veer as reaksie op die vermindering van die yswrag. Meer data oor die geskiedenis van die yskap behoort ons beslis te leer omtrent die gewenigheid van korsreaksie op vermindering en vermeerdering van belasting.

Suid-Afrika se geologiese navorsingsgebied le hoofsaaklik beperk tot die deel van die Ahlmannberge ten

Uitspanning in Antarktika. Die nunataks in die agtergrond is al wat van die berge bo die ys uitsteek.

'n Landmeter maak met dik handskoene 'n lyn vertelling aan sy teodoliet. Ook vir die opnieters bring Antarktika sy eie probleme wee.

DIE ONMISBARE LANDMETER

TUSSEN 1960 toe Suid-Afrika die navorsingsbasis, Norway Station, van die Note oorgeneem het, was die veldwerk vir 'n kaart van die omliggende gebied reeds voltooi. Suid-Afrikaanse landmeters doen daarom verder kartografiese werk in Antarktika. Landmeters is egter om verskeie redes noodsaaklik op die Antarktiese ekspedisies.

Eerstens moet SANAE se geografiese ligging elke jaar opnuut bepaal word. Die basis is op 'n drywende ysbank gelee, ongeveer 17 km vanaf die oop see en afhangende van die moontlike wisseling in jaarlikse tempo van ysvloei uit die binneland, mag die lengte- en breedtegraad waarop SANAE gelee is, van jaar tot jaar wissel.

Die meeste ander dissiplines maak ook van die hulp van die opmeter gebruik. So het geomagneetkundiges byvoorbeeld die hulp van 'n landmeter nodig wanneer die magnetiese deklinasie by 'n sekere punt vasgestel moet word. Die magnetiese deklinasie is die hoek tussen die ware noord — wat deur die landmeter bepaal moet word — en die magnetiese noord wat deur die geomagnetikus vasgestel word.

Gletserkundiges is in 'n groot mate van landmeters afhanklik wanneer hulle die tempo en rigting van ysvloei wil vasstel. (Sien bl. 17). Vir hierdie doel word 'n netwerk van merkers oor die gebied van bewegende ys wat bestudeer word, uitgemeet. Die posisie van die verskillende merkers t.o.v. mekaar en indien moontlik, t.o.v. sekere vaste punte, word elke jaar weer bepaal. Uit die vervorming van die oorspronklike netwerk word die vloeitempo en vloeiwyse van die ys afgelei.

Geologie — vervolg van bladsy 19

suide van SANAE wat met honde- of motorslee en ystrekkers bereik kan word. Navorsing in die Ahlmannberge is van belang omdat dit deel uitmaak van die tot dusver onbekende gebied tussen Victorialand en die Prinses Martha-kus wat hopelik die antwoorde inhou op sommige van die genoemde geologiese vraagstukke oor Antarktika en die res van die wêreld.

Die geologiese kartering op 'n skaal van 1:250,000 van sowat 8,700 vk km tot suwer na 72°20'S — is reeds voltooi. Hierdie gebied word gekenmerk deur ylverspreide nunataks en vinnige vloeiende ysriviere wat die kontinentale yskap langs die westelike en oostelike kante van die bergland dreineer en diep skeurvore ploeg waar dit deur die drywende ysbank na die Koning Haakon VII-see beur. Hierdie nunataks is slegs die boonste gedeeltes van 'n ysbedekte bergland wat na die suidooste gekantel is. Hierdie bergland maak deel uit van 'n blokverskuiwingsbergketting wat vanaf die Sør Rondanneberge in die ooste tot aan die Shacketonberge in die weste strek.

Die gesteentes van die Ahlmannberge is deel van 'n opeenvolging effens gekantelde, dan sedimentêre en vulkaniese lae waartussen verskeie soorte stollingsgesteentes ingedring het. Doleriet-plate van meer as 1,000 voet dik kom byvoorbeeld daarin voor.

Die oostelike grens van hierdie moontlike gesinkilnale opeenvolging is 'n trogverskuifde sone waarlangs die Penck- en Jutulsyriviere vandag vloei. Metamorfe en granitiese gesteentes van laat-Prekambriese ouderdom (550-1,500 miljoen jaar) dagsoom in die verre oostelike gebied naby die Russiese basis, Novolazarevskaya.

Suid-Afrika stuur sedert 1960 geoloë na SANAE. Die werkprogram van die ekspedisiegeoloog behels 'n ordeningsperiode van 3 maande (Augustus-Desember), 'n oorwintering van 13 maande (Januarie-Februarie) en 'n verwerkingstydperk van 6 maande nà sy terugkeer in Suid-Afrika. By SANAE word die navorsingsprogram hoofsaaklik volgens die seismiese ingedeel m.a.w. eers 'n laatsomervoltooiingsprogram wat geologiese, geofisiese en gletserkundige werk op die ysbank en in die berge behels en 'n tydens die hooftog na die suidelike bergs-bied plaasvind. Gedurende die donker wintermaande wanneer temperature benede -50°C daal, word waarnemings tot in en naby die onmiddellike omgewing van die basis beperk.

Die volgende geloë het sedert 1960 aan die program deelgeneem: Victor von Brünn (1960), Barry Butt (1961), Dirk Neethling (1962), Otto Langenegger (1963), André du Plessis (1964), Wolfgang Pollak (1965), Horst Bastin en Eduard de Ridder (1966).

GEOMAGNETIC recordings are essential for any studies of upper air physics or sun activity. The earth's magnetic field is the link between various upper air and inter-planetary fields of study including the ionosphere, cosmic radiation, radio atmospherics, the aurora and the wide variety of radiations emanating from the sun and which reach the the magnetosphere and penetrate the atmosphere.

To provide the information required by the various scientific disciplines, a world wide observational programme is being carried out to obtain accurate information on the configuration of the earth's magnetic field, and to ensure that any variations in the field are continually registered.

GEOMAGNETISM AND THE AURORA

MAGNETIC FIELDS encompass the earth and have lines of force extending far into the heavens and converging again at the poles. However, the earth is not uniformly magnetised and the principle magnetic poles are about 1,200 miles distant from its geographical poles. Furthermore, the magnetic field is constantly and irregularly changing. Measurements to determine the earth's magnetic field at any point must include observations which will define its direction in space and its magnitude.

The earth's magnetic field is subject to progressive change and other more or less regular time changes which take place chiefly during daylight and which vary in magnitude and character with geographical position, the season of the year and the disturbances of the sun.

Ideal site

In the Arctic and Antarctic regions, the behaviour of the magnetic field is unique due to the proximity of the magnetic poles and because of the rapid changes in the magnetic field in these areas within comparatively short distances and intervals of time. Owing to its location, almost directly under the so-called radiation anomaly, the SANAE base in the Antarctic provides an ideal site for observations of geomagnetic occurrences.

The most interesting phenomenon which can be studied at SANAE is the aurora which is invariably associated with magnetic storms. Charged particles from the sun, once trapped in the earth's magnetic field, travel in spiral paths around the lines of force and, on penetrating the atmosphere, they cause the air to glow by their impact to produce brilliant polar displays.

Polar light

From simultaneous photographs of the aurora, taken at stations known distances apart, it has been found that polar light beams generally do not come closer to the earth's surface than about 50 miles. The conclusion has therefore been drawn that the magnetic variations and disturbances also have their origin in electrical phenomena taking place at greater heights in the atmosphere.

Scientists from the Geomagnetic Observatory at Hermanus have spent a number of years obtaining records of the aurora in the Antarctic. To obtain a better understanding of this phenomenon, it has been suggested that photographs be obtained from above by mounting cameras on satellites.

The determination of absolute values of magnetic elements poses a number of problems, primarily as a result of the extremely low temperatures prevalent in the Antarctic. One problem with which the researchers have to contend, is that the research base is located on floating ice which is subject to unpredictable movements due mainly to tidal and glacial action.

Continuous registrations and standard measurements are made at the base. During the warm season, field studies are carried out on the mainland, dependent to a large extent upon the types of expedition and the personnel and equipment available.

As part of the Antarctic programme for 1964-65, journeys were undertaken from Cape Town to Marion Island and Gough Island where geomagnetic measurements and recordings were made.

Charts

Comprehensive reports on aurorae have been submitted to the IQSY headquarters where synoptic charts for the Southern Hemisphere are being prepared. As the data have a direct bearing on H.F. radio transmissions and other allied subjects, it is made use of both in South Africa and overseas and is contributing to a better understanding of one of the oldest phenomena in the world.

SELF-PRESERVATION

COLD WEATHER CLOTHING

It is important to wear the correct clothing for the conditions prevailing at any particular time. Remember that your body heat is retained by the layers of clothing and the air spaces between and in them. It is therefore necessary that the outer layer should be windproof. Your windproofs are made of material which prevents the entry of the outside air yet allows the body to transpire. Wet skin cools twenty times as fast as dry skin, so prevent yourself from sweating by removing some clothing or opening it sufficiently when working hard.

Remember that clothes, gloves and footwear should fit loosely, so that the insulation of the contained air is preserved and the circulation is not impeded. In particular, it is uncomfortable and dangerous to wear more socks or duffels than the footwear can easily contain. Successive layers of socks or duffels should be of increasing size. Remember too, that the wearing of cold-weather clothing makes you clumsy and more liable to accident. This also applies to the use of snow goggles.

Keep your clothing clean because dirty clothing, particularly when soiled with oils or blubber, loses much of its protective quality.

WIND CHILL

The stronger the wind the greater the dispersal of the warmed air contained in the layers of clothing. When the heat loss is greater than the rate at which the body can replace it frostbite will occur. The combined effect of low temperature and windspeed is known as the "WIND CHILL FACTOR". The combined effect of varying temperature and windspeeds is shown as an equivalent temperature in the chart. These figures refer only to <u>exposed flesh</u>.

SNOW BLINDNESS

Snow blindness is due to exposing the eyes to excessive ultr-violet radiation. This occurs when working in, or travelling over, snow covered areas. WEAR YOUR DARK GLASSES or you will regret it. Snow blindness is contracted equally on sunny days, overcast days or in "whiteout".

WIND-CHILL CHART

Estimated Wind Speed MPH	ACTUAL THERMOMETER READING °F.											
	50	40	30	20	10	0	—10	—20	—30	—40	—50	—60
	EQUIVALENT TEMPERATURE °F.											
Calm	50	40	30	20	10	0	—10	—20	—30	—40	—50	—60
5	48	37	27	16	6	—5	—15	—26	—36	—47	—57	—68
10	40	28	16	4	—9	—21	—33	—46	—58	—70	—83	—95
15	36	22	9	—5	—18	—36	—45	—58	—72	—85	—99	—112
20	32	18	4	—10	—25	—39	—53	—67	—82	—96	—110	—124
25	30	16	0	—15	—29	—44	—59	—74	—88	—104	—118	—133
30	28	13	—2	—18	—33	—48	—63	—79	—94	—109	—125	—140
35	27	11	—4	—20	—35	—49	—67	—82	—98	—113	—129	—145
40	26	10	—6	—21	—37	—53	—69	—85	—100	—116	—132	—148
Wind speeds greater than 40 MPH have little additional effect	LITTLE DANGER FOR PROPERLY CLOTHED PERSON				INCREASING DANGER			GREAT DANGER				
	DANGER FROM FREEZING OF EXPOSED FLESH											

To use the chart, find the estimated or actual wind speed in the left-hand column and the actual temperature in degrees F. in the top row. The equivalent temperature is found where these two intersect. For example, with a wind speed of 10 mph and a temperature of —10°F., the equivalent temperature is —33°F. This lies within the zone of increasing danger of frostbite, and protective measures should be taken.

Some hours after exposure the eyes begin to smart and water; soon it is as though they are full of sand and even blinking is painful, while reading is impossible. The accompanying pain may be very severe, causing headache and sleeplessness. These symptoms will last at least 24 hours and may continue for many days. During this time it is necessary to remain in a darkened room or tent, or to have the eyes bandaged. Time is the cure but cool compresses and aspirin will help relieve pain.

FROST-BITE

Frost-bite is common on the face, hands and feet. Its onset may be noticed from a sudden but momentary tingling of the nose, cheek or ear, followed by stiffening of the muscles. As this event may pass unnoticed it is important for companions to observe each other at frequent intervals. Tell-tale white spots reveal the occurrence, and usually a brief warming with the hand is sufficient to check the trouble.

If face, hands or feet which were previously hurting cease to hurt, and feeling is found to be lost, investigate immediately; lack of sensation means frost-bite.

At low temperatures be very careful not to let the hands get wet with petrol or oil. NEVER RUB A FROST-BITE WITH SNOW!

In all cases of severe frost-bite the sufferer should, if possible, be moved to a station where medical facilities or advice are available. Slow and inadequate warming of the frozen part when followed by refreezing always results in severe injury. The frost-bitten part should be placed in a deep container of water at 105° to 110°F for about 20 minutes, or until the part goes red. If no thermometer is available test with the elbow, which should be held in the water.

CARBON MONOXIDE POISONING

Carbon monoxide is colourless and odourless, and is produced by incomplete combustion. It may originate from stoves or engines. There is no warning to those asleep or those who enter a saturated space. The first symptom of poisoning is a burning sensation in the eyes. More serious symptoms are headache, dizziness, throbbing of the temples, weariness, nausea, ringing in the ears, throbbing of the heart and buckling of the knees.

The gas forms a relatively stable compound with haemoglobin, called carboxyhaemoglobin, and prevents the blood from carrying oxygen. In affected persons the skin is pink or pale and the lips bright red.

Treatment is by removal to fresh air, application of artificial respiration, administration of pure oxygen, stimulation of circulation and complete relaxation. The treatment must be prompt if death or permanent mental deterioration are to be avoided.

Stoves should not be left burning overnight unless they are periodically checked by a watchman, who should ensure that the chimney is clear and that adequate ventilation is provided.

EXPOSURE

Notes on Recognition of Symptoms and on Treatment

DEFINITION OF EXPOSURE

This is not a strict medical term but in general usage it describes the serious effects which may result from exposure to climatic hazards. It is, in general, limited to the effects of cold environments, phrases frequently used including "suffering from exposure", "death from exposure", "risk of exposure". The essential feature of conditions described in this way is a reduction in the heat content of the body. This becomes serious when deep body temperature begins to fall. So, a definition of exposure to meet the current use of the term is: severe chilling of the body surface leading to a progressive fall of body temperature with the risk of death from hypothermia.

DANGERS OF EXPOSURE

Ignorance on the part of helpers and rescuers has often led to dangerously incorrect treatment being given to those suffering from exposure. It is one main purpose of these notes to increase the knowledge and understanding of the signs, symptoms and correct treatment of exposure among those who may be called upon to deal with people suffering from this condition. It is emphasized that the question is a complicated one, and that these notes give only brief, and to that extent, superficial answers.

It is the combination of fatique, cold, anxiety or mental stress which is especially dangerous. The elements in this combination will vary greatly with the individual, as will the individual's susceptibility to some or all of these factors. In considering exposure to cold it is well to bear in mind that it is the additional factor of physical exhaustion, together with cold, which kills quickly. Death has overtaken people who, thinking they must keep moving at all costs, have "bashed on" instead of resting in some shelter before exhaustion supervened. The essential is always to preserve a sufficient reserve of energy in severe conditions of cold and high wind.

It may be added that an injured and immobilized man may be killed by cold even if he is not physically exhausted, but in such cases death will not normally occur so rapidly, and it should be possible to put in hand rescue operations before a casualty dies of cold. But in general it is emphasized that the risk of death from exposure is a real, and often unrecognized danger, especially among newcomers to the Antarctic.

SIGNS AND SYMPTOMS

It is not always easy to decide early enough that you have a mild case of exposure on your hands. It is very important to do so, since it may be possible to avoid a crisis if at the outset you are aware of the symptoms and can begin to treat them. The following are among the most usual symptoms:

a) Unexpected and apparently unreasonable behaviour, often accompanied by complaints of coldness and tiredness.

b) Physical and mental lethargy, including failure to respond to, or to understand questions and directions.

c) Failure of, or abnormality in vision. It should be noted that some failure of vision is a very usual symptom, and when this does occur the condition should be regarded with extreme seriousness.

d) Some slurring of speech. There is not necessarily early failure of speech, and the victim may speak quite strongly until shortly before collapse.

e) Sudden shivering fits.

f) Violent outbursts of unexpected energy - possible physical resistance to succour - violent language.

g) Falling.

N.B. It should be stressed that not all of these symptoms may be noticed, nor necessarily in this order. Other symptoms which may sometimes be observed are muscle cramp, extreme ashen pallor, light-headedness, occasionally a fainting fit.

GENERAL

In normal conditions the inner "core" (trunk and brain) of the body remains constant at 37°C (98.4°F); the temperature of the outer shell is always below this. This outer shell consists of the skin, underlying fat and muscle, and extremities (arms and legs, ears, nose), and comprises almost half of the body.

What is VITAL is the preservation of the deep core temperature. A shift in this leads directly to MENTAL DETERIORATION and LOSS OF MUSCULAR CO-ORDINATION, and eventually to UNCONSCIOUSNESS, HEART and RESPIRATORY FAILURE and DEATH. The body itself acts to maintain core circulation and temperature by restricting the flow to the exposed periphery so that core blood is not cooled at the surface.

In any treatment therefore, the importance must be realised of not increasing peripheral circulation unless there is minimal loss of heat at the skin surface. Further heat loss from the core must at all costs be avoided. SUDDEN SURFACE WARMING IS THEREFORE WRONG.

When once the symptoms are clearly established, any further exertion, such as forcing the victim to go on walking, even downhill, must be avoided. The party must stop, and proceed to treatment. IT IS IMPOSSIBLE TO OVERSTRESS THE IMPORTANCE OF THIS.

IMMEDIATE TREATMENT IN THE FIELD

As already indicated, the risk of precipitating a sudden surge of circulation to the surface, such as may be produced by (a) hot water bottles, (b) rubbing, or (c) alcohol intake SHOULD BE AVOIDED. The precipitation of a sudden surge of core blood can be disastrous as this blood is cooled by going through the cold outer shell and is then returned to the heart. Unexpected deaths of raft survivors are often due to this. The essential and immediate treatment is to prevent further heat loss by insulating the body.

Methods will vary according to conditions and the equipment immediately available. An outline of what should be done, if at all possible, is:

a) Get the victim into a sleeping bag, or if this is impracticable wrap him in sleeping bags to provide insulation below as well as above the body.

b) Place a fit companion alongside him to provide bodily warmth.

c) Insulation between him and the ground is the most important thing of all.

d) If a tent cannot be pitched try to provide some form of shelter such as a windbreak.

e) If the victim can still take food, sugar in an easily digestible form (e.g. condensed milk) may be given.

f) If respiration ceases, perform artificial respiration continuously by mouth-to-mouth method until the patient breathes normally himself.

There will then normally ensue a period, perhaps of some hours duration, before the rescue party (with stretcher) that has been summoned, can arrive. Even if the patient apparently recovers in a short time, and even if he insists that he is quite fit, he must still be rested for 24 hours.

Once the patient has been insulated a brew-up should be started, and hot drinks and food should be given to him according to what he can take. Food and hot drinks should be taken also by those members of the party who have been with him, as it is safer to regard them also as suffering in some degree from shock and exhaustion.

TREATMENT ADVISED IF THE PATIENT CAN BE BROUGHT TO BASE

If it can be done, rapid re-warming by total immersion in a hot bath (not to exceed 45°C, 113°F) is a proved life-saver. Use a thermometer; otherwise judge the safe heat as being the hottest temperature in which an immersed elbow can be kept. After the body temperature has returned to normal the patient should be placed in a warm room at 68°-70°F. The point of time at which to make this transfer may be roughly judged as being the same time as that at which the patient in the bath begins to sweat.

CONCLUSION

It is emphasized that it is far better to take what steps you can to avoid cases of exposure than to have to treat them. In conditions of cold, especially if there are strong winds as well, leaders of parties should keep a sharp watch for signs of exhaustion in their men. It is only a combination of experience, skill and alert awareness of what is happening to your companions which will enable you to take the necessary steps early enough.

THE ANTARCTIC TREATY

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

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

Acknowledging the substantial contributions to scientific knowledge resulting from international cooperation in scientific investigation in Antarctica;

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

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

Have agreed as follows:

ARTICLE I

1. Antarctica shall be used for peaceful purposes only. There shall be prohibited, inter alia, any measures of a military nature, such as the establishment of military bases and fortifications, the carrying out of military manoeuvres, as well as the tesing of any type of weapons.

2. The present Treaty shall not prevent the use of military personnel or equipment for scientific research or for any other peaceful purpose.

ARTICLE II

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

1. In order to promote international cooperation in scientific investigation in Antarctica, as provided for in Article II of the present Treaty, the Contracting Parties agreed that, to the greatest extent feasible and practicable:-

a) information regarding plans for scientific programs in Antarctica shall be exchanged to permit maximum economy and efficiency of operations;

b) scientific personnel shall be exchanged in Antarctica between expeditions and stations;

c) scientific observations and results from Antarctica shall be exchanged and made freely available.

2. In implementing this Article, every encouragement shall be given to the establishment of cooperative working relations with those Specialized Agencies of the United Nations and other international organizations having a scientific or technical interest in Antarctica.

ARTICLE IV

1. Nothing contained in the present Treaty shall be interpreted as:-

a) a renunciation by any Contracting Party of previously asserted rights of or claims to territorial sovereignty in Antarctica;

b) a renunciation or diminution by any Contracting Party of any basis of claim to territorial sovereignty in Antarctica which it may have whether as a result of its activities or those of its nationals in Antarctica, or otherwise;

c) prejudicing the position of any Contracting Party as regards its recognition or non-recognition of any other State's right of or claim or basis of claim to territorial sovereignty in Antarctica.

2. No acts or activities taking place while the present Treaty is in force shall constitute a basis for asserting, supporting or denying a claim to territorial sovereignty in Antarctica or create any rights of sovereignty in Antarctica. No new claim, or enlargement of an existing claim, to territorial sovereignty in Antarctica shall be asserted while the present Treaty is in force.

1. Any nuclear explosions in Antarctica and the disposal there of radioactive waste material shall be prohibited.

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

ARTICLE VI

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

ARTICLE VII

1. In order to promote the objectives and ensure the observance of the provisions of the present Treaty, each Contracting Party whose representatives are entitled to participate in the meetings referred to in Article IX of the Treaty shall have the right to designate observers to carry out any inspection provided for by the present Article. Observers shall be nationals of the Contracting Parties which designate them. The names of observers shall be communicated to every other Contracting Party having the right to designate observers, and like notice shall be given of the termination of their appointment.

2. Each observer designated in accordance with the provisions of paragraph 1 of this Article shall have complete freedom of access at any time to any or all areas of Antarctica.

3. All areas of Antarctica, including all stations, installations and equipment within those areas, and all ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica, shall be open at all times to inspection by any observers designated in accordance with paragraph 1 of this Article.

4. Aerial observation may be carried out at any time over any or all areas of Antarctica by any of the Contracting Parties having the right to designate observers.

5. Each Contracting Party shall, at the time when the present Treaty enters into force for it, inform the other Contracting Parties, and thereafter shall give them notice in advance, of

a) all expeditions to and within Antarctica, on the part of its ships or nationals, and all expeditions to Antarctica organized in or proceeding from its territory;

b) all stations in Antarctica occupied by its nationals; and

c) any military personnel or equipment intended to be introduced by it into Antarctica subject to the conditions prescribed in paragraph 2 of Article I of the present Treaty.

ARTICLE VIII

1. In order to facilitate the exercise of their functions under the present Treaty, and without prejudice to the respective positions of the Contracting Parties relating to jurisdiction over all other persons in Antarctica, observers designated under paragraph 1 of Article VII and scientific personnel exchanged under subparagraph 1 (b) of Article III of the Treaty, and members of the staffs accompanying any such persons, shall be subject only to the jurisdiction of the Contracting Party of which they are nationals in respect of all acts or omissions occurring while they are in Antarctica for the purpose of exercising their functions.

2. Without prejudice to the provisions of paragraph 1 of this Article, and pending the adoption of measures in pursuance of subparagraph 1 (e) of Article IX, the Contracting Parties concerned in any case of dispute with regard to the exercise of jurisdiction in Antarctica shall immediately consult together with a view to reaching a mutually acceptable solution.

ARTICLE IX

1. Representatives of the Contracting Parties named in the preamble to the present Treaty shall meet at the City of Canberra within two months after the date of entry into force of the Treaty, and thereafter at suitable intervals and places, for the purpose of exchanging information, consulting

together on matters of common interest pertaining to Antarctica, and formulating and considering, and recommending to their Governments, measures in furtherance of the principals and objectives of the Treaty, including measures regarding:

(a) use of Antarctica for peaceful purposes only;

(b) facilitation of scientific research in Antarctica;

(c) facilitation of international scientific cooperation in Antarctica;

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

(e) questions relating to the exercise of jurisdiction in Antarctica;

(f) preservation and conservation of living resources in Antarctica.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(Here follow the signatures on behalf of the Governments of:- Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, Union of South Africa, Union of Soviet Socialist Republics, United Kingdom of Great Britain and Northern Ireland, United States of America).

SOME SAFETY "DO's AND DONT's"

At Base

1. Do not hang clothing near stoves or chimneys.
2. Do not use AVTUR or paraffin to light fires.
3. Do not overload electrical circuits: this is a fire hazard.
4. Study and memorize the fire fighting instructions.
5. Beware of toxic gases from faulty stoves and chimneys.

When Travelling

6. Assess the weather and start dressed correctly.
7. Learn the morse code and how to operate field radios.
8. Check out when leaving base or camp, stating destination, route and time of return.
9. Never travel alone; always take 10 days' rations for men and dogs, plus fuel and camping equipment.
10. Do not travel in a 'whiteout', or in drift, over unknown ground.
11. Beware of crevasses: probe the bridges; wear skis; rope up; cross at right-angles.
12. If caught in a blow dig-in for shelter. Do not wander aimlessly about.
13. In a blow do not move out of sight of tent or building unless attached to a rope.
14. Always have readily available spare dry duffels for hands and feet.
15. Wear dark glasses or goggles during daytime, even if it is overcast.
16. Learn how to pitch a tent in windy conditions.
17. Ensure that the tent valence is weighted and all guys se., even in fine weather.
18. Ensure that the tent air vent is always clear of drift snow and ice.

19. Do not work dogs more than eight hours per day; do not run dogs until six hours after feeding.

20. Tractors should never cross doubtful ground singly.

21. Do not allow your visibility to be impaired by dirty or iced windscreens; if they are obscured STOP.

22. Static electricity is prevalent; earth fuel nozzles to vehicle or aircraft before refuelling.

23. Do not smoke when refuelling.

24. Do not smoke in aircraft without the pilot's permission.

25. Be careful handling fuel in low temperatures; fuel on wet hands causes frostbite.

26. Do not use petrol in primus stoves or pressure lamps.

27. Beware of sea ice: do not travel on sea ice without consulting those with local knowledge.

28. Sew your gloves onto neck harness.

29. Learn the rope techniques for crevasse rescue.