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Exploration REVIEW

FEBRUARY 1962 PRICE 1/6

IMPERIAL COLLEGE EXPLORATION SOCIETY

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EXPLORATION REVIEW

FEBRUARY 1962
Number Three.

JOURNAL OF THE IMPERIAL COLLEGE EXPLORATION SOCIETY

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FOREWORD

By *Sir Vivian Fuchs*

EXPLORATION implies discovery! The discovery may be something new to the individual alone in which case he may best be described as a traveller. If the discovery is new to the community then he may more correctly be described as an explorer. Yet there has been no exploration unless the information has been recorded and made available to all.

In the early days there were countless travellers in Asia, Africa and elsewhere whose stories led to fabulous accounts of strange creatures and terrible conditions. These endless inaccuracies were, like rumour, founded on verbal accounts and the originators were soon forgotten.

It took a Marco Polo, or a Mungo Park to produce written records for all to read. In this way the curiosity of others is aroused and they set out to add to the record. The more intelligent the man, the more accurate will be his observations. To explore and to be careless in recording is not merely a failure, it is an active disservice to those who come after.

Everyone must make a beginning, but the early attitude to observation and careful recording establishes the routine habits that are so important in later studies. To travel and to see, to see and by reasoning to understand is the first precept of the explorer. The second is to set down the unembellished facts as a record which can later be used for deduction and theory. One may say with Caesar "Veni vidi, vici", but for the explorer or traveller the final conquest is in the written word.

IMPERIAL COLLEGE EXPEDITIONS

Up to the present time, the following expeditions have been supported by this College

1938 Jan Mayen Island Expedition — Greenland Sea.

1956 Eastern Iceland Expedition.
Carmargue Expedition — Rhone Delta.
Norway Expedition — Allfonbreen Glacier.
Swiss, Himalayan Training Expedition — Karakoram.

1957 Karakoram Expedition — Led by Eric Shipton.
Ghana Expedition.
Arctic Norway Expedition.

1958 Ghana Expedition.
Norway Exedition — Voss.
Eastern Iceland Expedition

1959 Aplobamba Andean Expedition — Bolivia.
Azores Expedition — underwater.
Greece Expedition — biological.
British Guiana Expedition.
Eastern Iceland Expedition — geological.
Jan Mayen Island Expedition — Greenland Sea.

1960 St. Kitts Expedition — all woman.
Around the Atlantic Expedition — Africa and the Americas.
Iran Expedition.
Eastern Iceland Expedition.
Central Iceland Expedition.
Cornwall Expedition — underwater.
Spitzbergen Expedition.
Ghana Expedition.
Kashmir Expedition — overland.

1961 Beerenberg Expedition — Jan Mayen.
Oksfjordjökul Expedition — Arctic Norway.
Malta Expedition — underwater.

EDITOR'S NOTE. The ensuing articles have been written with a view to being of general interest. For the technical accounts and scientific results of the College expeditions, the reader is referred to their final reports. These may be seen in the library of the Royal Geographical Society, and in the College Haldane and Lyon Playfair libraries.

Your attention is drawn to the new presentation of Exploration Review which we have been able to produce by letterpress for the first time. The photographs are reproduced from half-tone blocks and the cover has been redesigned. This accounts for the increased price.

A FEW words about some of our contributors . . . .

George Greenfield is a director of a firm of literary agents. In 1960, he helped the St. Kitts Expeditions to arrange the publishing of a book.

Ian Hampton is now working for the Medical Research Council at Hampstead. As a student, he went on an expedition to Northern Sweden, and more recently has returned from two years with the Falkland Islands Dependencies Survey.

Tony Smyth is an old student of Imperial College, where he developed his keen interest in mountaineering. He has led two expeditions to the Karakoram, and is now teaching science at St. John's School, Leatherhead — having retired from the Air Ministry.

Directorate of Oversas Geological Surveys in London. He was a member of the 1957 Karakoram Expedition.

EDITORIAL

FIRST we would like to apologise for the inadequacies which may appear when you read this issue of Exploration Review. It is handicapped by having had to struggle to emerge without the handing over experience of last year's editor, Peter Smith, in the atmosphere of depression which must inevitably follow such a disaster as befell him when, together with his companions, he was lost off Jan Mayen last summer.

Enterprise suffers set-backs; explorers are lost exploring, but explorers must go on exploring, travellers must go on adventuring, and mountaineers must go on climbing. For from the first setting off into the unknown in the early twilight of creation, through the fabled journey of Jason in the Argo in search of the golden fleece, through the known historical expeditions of Columbus and Marco Polo, even to the recent settings forth of Whymper and Scott, Hilary and Fuchs, and our own modest venture to Jan Mayen, there has been a compulsion to make known the unknown and to tread the untrodden ways. It is one thread, a durable one, in the warp and weft of the fabric of human nature.

Man benefits from these expeditions in the acquisition of physical facts of the universe, and in the impact on other men, of the spirit of the adventurer who goes out to discover. One contemplates the rough sketch-like maps of 300 years ago, side by side with the accomplished and accurate work of the 20th century cartographer. There are few parts of the earth's surface that are entirely unknown — with the possible exception of polar regions and certain limited areas elsewhere. Pioneers have penetrated into the remotest parts of the world, and large blank spaces in our maps have been filled from the accounts they brought back.

The spiritual effects of Scott's last diary of the expedition to the South Pole, must immediately come to mind as an outstanding example of heroism and self sacrifice. One of the last entries in his diary reads, "How much better has all this been than lounging in too great comfort at home". There is no self pity here.

Imaginations are stirred by heroism. The challenge of loss or failure is taken up, and a few men, unconsciously embodying the noble aspirations felt in the heart of mankind, step out. Another expedition is born.

And for the anguish that only the loved ones of those who go out and do not return know, there is time, the wonderful softener and healer.

"There are waters blown by changing winds to laughter
And lit by the rich skies, all day. And after,
Frost, with a gesture, stays the waves that dance
And wandering loveliness. He leaves a white
Unbroken glory, a gathered radiance,
A width, a shining peace, under the night".

Rupert Brooke.

PRESIDENT'S REPORT

THE Exploration Society is now four years old and this seems to be an opportune moment to review its brief history.

It became apparent, soon after the College started to support expeditions, that students with an interest in exploration needed to meet in order to discuss their ideas. To this end, the Exploration Society was founded early in 1958. As well as encouraging ideas for expeditions, the Society aims at creating a nucleus of experienced explorers to assist in their organisation. Furthermore, it serves as the main contact between the students and the Exploration Board.

By 1960, the Society had become firmly established and under the lively presidency of Peter Smith, new strides were made in arousing interest both inside and outside College. In that February, an 'Exploration Week' was organised. An exhibition, which showed the activities of past Imperial College expeditions, was visited by a large number of people and acknowledged to have been a great success. At the same time, the Society's Journal was launched. This has become an annual publication and this year is printed by letterpress for the first time. The Annual Dinner was the third important venture to materialise during that week. At this dinner we aim at entertaining people who have helped us as well as making new friends in the sphere of exploration. At last year's dinner, attended by over sixty people, we were honoured by having Sir Vivian Fuchs as our principal guest.

This year the increased interest in exploration is marked by the record number of members. Last term we held six meetings. Mr. J. W. Wright spoke on the application of Aerial Photography to exploration. He illustrated his talk by showing the film of the Falklands Islands Dependencies Aerial Survey Expedition and showed how the technique of air survey can be of use to almost every expedition. A very interesting talk on the I.C. Malta Underwater Archaeological Expedition of 1961 was given by its leader, John Woods. He laid emphasis on the pioneer work being undertaken by I.C. in this field. A week after our showing of the film of the Commonwealth Trans-Antarctic Expedition, which attracted a very large audience, Mr. W. O. Sloman visited us to talk about the opportunities for scientists on F.I.D.S. (now renamed British Antarctic Survey). Another successful and valuable evening was spent in discussing the various aspects of the organisation of expeditions. One cannot summarise the term's activities without including the General Studies Lecture

organised by the Society. At this, we had the good fortune to hear Eric Shipton lecture on his most recent expedition to Patagonia, which he illustrated with some excellent slides.

The main social event to come is the Annual Dinner which will be held this year on Thursday 8th March, when our principal guest will be Sir Raymond Priestley, President of the Royal Geographical Society.

During its few years of existence, the Society has paved the way for future explorers. I hope that they, in turn, may extend this work with the same courage, persistence and resourcefulness as their predecessors.

EXPEDITIONS 1962

The following expeditions have received the approval and support of the Imperial College Exploration Board.

Horn Sund Expedition — Spitzbergen. The Expedition is to carry out a detailed glaciological investigation of the Werenskiold Breen glacier in the south-west of West Spitzbergen.

Expedition to Western Sicily. An archaeological and zoological Expedition — a team of underwater divers will make an examination of a submerged Phoenician Port.

Expedition to the Sudan and Ethiopia. An archaeological and geological Expedition — in the Sudan it will study ring dyke structures, whilst in Ethiopia a separate party will make a survey of archaeological sites, cave dwellings and incised rock drawings, etc.

Expedition to Nigeria. This is a botanical expedition, whose major aim is to make a collection of plant material from an area in the Plateau Province of Nigeria, one which has not been visited by botanists since the last century.

A Literary Agent Looks At Expeditions

By *George Greenfield*

IT was announced recently that a weary traveller would always know when he had penetrated into the upper reaches of the Amazon by the deafening noise—the rattle of typewriters pounded by numerous explorers, mainly Old Etonians, as they beat our their memoirs. Since the Book of Exodus and Homer's *Odyssey*, the travel-book has provided instructions and entertainment for the many and an income for the few. Each year several hundred such books are published; the very successful may sell up to fifty thousand copies each, the unsuccessful may struggle to a sale of fifteen hundred copies and then quietly expire.

Television is also a potent lure for the expedition that needs either finance or self-expression or, usually, both. The whirr of the cine camera is heard today in the most exotic places. But here again the competition is fierce and the standards exacting. For every David Attenborough and Peter Scott, who have become national figures, there are dozens of films shot by keen amateurs which never get beyond the projection room of the BBC Studios at Ealing.

Up to a few years ago there was a certain novelty-value about University expeditions. Less than a dozen went out each year and the more ambitious were almost certain to get a hearing from the public. In 1961 there were something like sixty expeditions sponsored by different University or college authorities. Most of them had woken up to the fact that there is a market for books, newspaper articles and television films. All of them needed extra finance. Sadly enough, all but the smallest minority must have been disappointed. An expedition that fires the public imagination, such as the Everest Expedition or the Trans-Antarctic Expedition, can earn well into six figures by the sale of book, serial, film and television rights—to the extent that it can, and in the case of the two mentioned here does, set up a sizeable fund out of its surplus for the support of future expeditions engaged on similar activities. But talking in terms of thousands is of no help to the small University expedition which usually feels happy if it can scrape together an extra couple of hundred pounds over and above grants from college and public bodies.

With the existing competition, even finding small sources of additional income can be a tough struggle and the help and advice of a literary agent may come in useful. At this point I would like to digress in order to clear up a confusion that seems to exist in the minds of almost all newcomers to the world of expeditions. It lies in the difference between a "publicity agent" and a "literary agent". Briefly, the job of the former is to help his clients by getting their names (or the names of their products, if they are manufacturers) as widely known as possible. To this end, he *gives* information freely to the Press and tries to dress it up in a provocative way so that the Press will publish it as an item of human interest or general knowledge. He derives his income by charging his clients fees for his services. The job of the

literary agent is to *sell* his clients' writings to book publishers and periodical editors on an exclusive basis—that is to say, he cannot, of course, sell the same matter to two different sources simultaneously. His income is derived by charging his clients a commission (usually ten per cent) on all sales he makes for them.

Most University expeditions do not need, nor could they afford, the services of a high-powered publicity agent. Yet, up to a certain point, publicity can be useful in stimulating the public's interest. An appearance on the BBC "Tonight" programme or a brief report in a national daily paper can attract publishers and editors. The phrase "up to a point" is an important qualification. Newspaper editors in particular demand what they call "exclusivity" when they happen to be paying for it. They don't build multi-million circulations by publishing what everyone else has previously printed. Some editors will even put a stop on television appearances until after their exclusive articles by the explorer or traveller have been published. Only a few years ago a major expedition lost a two thousand pound serial deal because the editor in question had made a proviso that there were to be no prior releases of the material through the BBC, sound radio as well as television. Unknown to the Expedition committee, one or two of the scientific members had arranged to give some talks on the Third Programme, which unfortunately preceded the serial version. Although these talks would only have been heard by a tiny percentage of the editor's readership, he at once cancelled the deal on the (perfectly legitimate) grounds that there was a breach of contract on the expedition's part.

Sometimes a small expedition finds itself willy-nilly in the news, as a result of some exciting discovery or, regrettably, catastrophe that has occurred during its travels. In that case, the leader should be responsible for giving Press interviews and every other member should keep silent. Reporters are adept at worming out facts and opinions, which may have to be compressed or slanted to provide a titillating headline. To avoid having different versions of the events published, the leader should be the sole spokesman for the whole team.

What kind of expedition has the biggest potential appeal to the public? Let me qualify that question by saying at once that, where University expeditions are concerned, the scientific programme must be the main objective; no one expects the whole project to be tailored to suit the readership of a newspaper or book editor. But, once the area and the subjects to be studied on the ground have been agreed with the college authorities, it is sometimes helpful to be able to assess the prospects of amassing more funds through the sale of literary rights. The ideal expedition from the reading public's viewpoint is the one that sets out to achieve a feat that has not been accomplished and moves towards its goal in such a way that the reader can judge its progress at any given time. Two classic examples are the Ascent of Everest and the Crossing of Antarctica. In each case a splendid feat of resolution and physical endurance was attempted. In each case the target was clearly defined; when Hillary and Tensing stood on the top of Everest or when Fuchs and his men reached Scott Base, there was no doubt in anyone's mind that the object of the expedition had been achieved.

Conversely, the British North Greenland Expedition, which took place midway between these other two, has never captured the public imagination to anything like the same extent, although it lasted for two years and carried out many worthwhile scientific research programmes in conditions not less arduous than those of the

Antarctic. The reason may lie in the fact that it was mainly a static expedition. It set up a base in North Greenland from which numerous journeys were carried out and it also formed an observation post named Northice at what was perhaps the most northerly spot in the world to be inhabited for months at a time. But the only occasion on which the Expedition really hit the headlines was when an RAF aircraft doing a supply-drop crash-landed, luckily without loss of life or serious injjury. Somehow a static expedition can never match in public interest one that moves through unknown regions towards a definable goal.

There are other quite arbitrary factors which an editor will find newsworthy. One is "Women"—preferably young ones. The recent all-woman Himalayan expedition received far more Press attention than any male climbing team since the Everest expedition, even though its programme was naturally more modest. And to cite an example from your own college, the St. Kitts Expedition of 1960 found several publishers tumbling over each other to advance money on the writing of a book. Had the two charming girls who formed the party, Miss Phillips and Miss Hocking, been of the opposite sex, one doubts whether the publishing interest would have been more than polite at best.

There is little scope in a short article for going into the detail of the various rights that an expedition has to sell. In outline, these fall into three or four categories.

Book rights: assuming the general interest is there, a publisher can often be found who will buy an option on publishing a book on the expedition's experiences. Buying an option is not the same thing as formally committing the firm to publish the resulting book in any event. (Publishers have occasionally been bitten in the past and have found themselves committed to spend more money on issuing an indifferent or mainly unsaleable book.) Nowadays they tend to pay for the right to have first look at the completed typescript but reserving the equal right to refuse to publish after they have studied it. In that case, the expedition is free to keep the option payment which has no doubt been spent anyway, but usually with the understanding that if the book should be placed with another publisher, the first backer will get his money returned eventually. Option payments vary with the importance of the subject but are mainly in the £100-£200 range.

Serial rights: before an expedition book is published, a newspaper or magazine may buy the right to print extracts from it in consecutive issues. Serial rights should not be confused with *feature article rights*. In the latter case, the newspaper or magazine buys the right to publish separate and self-contained articles when the expedition is in the field (e.g. The Times and the Trans-Antarctic Expedition) or on its return to the United Kingdom. If an expedition is important enough, it may be able to sell both types of rights but usually one sale precludes the other. Most national newspapers and magazines will pay at least one thousand pounds for First (i.e. before book publication) Serial rights but obviously the expedition concerned must have an exceptional story to sell. The more modest University expedition is better advised to concentrate on selling individual feature articles to specialist magazines. It would pay the leader to study the Periodicals Section in *The Author's and Artist's Year Book*. To give a couple of random examples, a magazine like *Photoguide* will sometimes publish an article dealing with the taking of photographs under highly unusual or difficult conditions, or *The Autocar* might be interested in an illustrated piece on the performance of a certain type of vehicle over rough terrain.

This leads on to *Photographic Rights*, which are often a neglected form of income for a small expedition. All expeditions return with several hundred or more monochrome prints and often colour transparencies as well. If a book is written and published, perhaps two dozen of them are included but the rest often repose in members' private albums. There are several specialist photographic agencies (usually to be found in the Fleet Street area) always on the look out for good clear prints of off-the-map areas or exotic events. Each time a print is published, the copyright holder gets a fee of thirty shillings or two guineas; it is surprising how quickly the income can mount up. But the standards are exacting—a blurred picture or one of the "happy snap" variety will be ruthlessly rejected.

Television rights: David Attenborough's department in the BBC used to advance money to small expeditions to help in the purchase of film stock but the results were so disappointing that nowadays the BBC will only consider buying films after they have been shot. Rates of payment vary; a half-hour film transmitted as one of a major series will receive around £500 for one showing and perhaps half that amount for a repeat in a Children's Hour Programme. But here again, the competition is so fierce that the photographer must be to or near professional standard. One of my more embarrassing experiences in recent years was to sit in a private viewing studio with several important television executives and watch the "rushes" of a film shot by an under-water expedition. Over three-quarters of an hour's duration had been shot: about one and a half minutes of it were usable. The rest was either blank or at the best, a realistic impression of a "pea-souper" fog with vague bodies swanning in and out of view. An expedition that is determined to get its results screened should first approach a professional unit like Gateway Films or Countryman Films months before it sets out. If it can get such a body's interest, it will be given expert advice and help in the shooting, cutting, dubbing and marketing of its film on a profit-sharing basis.

Lecture rights: these fall outside the province of a literary agent but are worth mentioning as another form of income. The lecturer needs, apart from the gift of the gab, three or four dozen good colour transparencies and an interesting story to tell. Foyles in Charing Cross Road run a well known lecture agency; fees per lecture vary with the importance of the subject and the speaker and may be anything from fifteen guineas plus expenses to twice or three times that figure.

I have only had space to mention the major sources by which an expedition may with luck turn its bank balance from red to black. Which raises a final point. A surplus of funds can sometimes be almost as embarrassing as a deficit. Most colleges that sponsor expeditions rightly insist on getting back moneys they have advanced, together with a percentage of the profits which is pooled to help future expeditions. But if there is a real "turn up for the book", the members may find themselves with several hundred pounds in the bank. Thus it is essential to make clear cut and fair arrangements on how a lucky surplus is to be shared out—long before the journey begins. Big expeditions in fact have a form of agreement drawn up, which each member signs on joining.

There is also the question of copyright to be decided. Copyright usually belongs to the person who performs the action necessary to bringing it into being: to the writer in the case of a book and to the individual who clicked the shutter in the

Continued on page 30.

Glaciological Research In Jan Mayen

by John Sheard

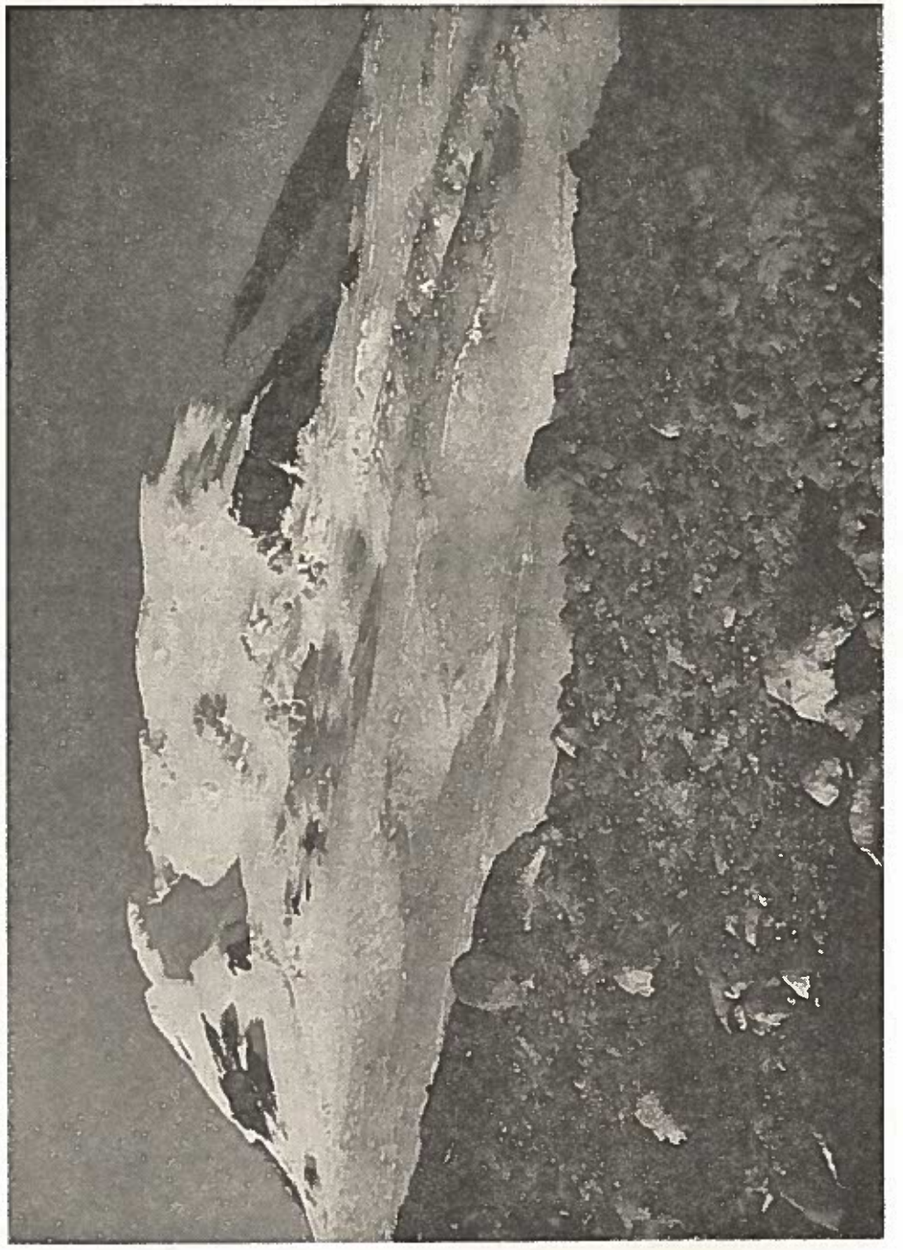
IN 1959 a party of scientists from Imperial College, led by the late Peter Smith visited Jan Mayen Island as members of a University of London Expedition. The reader is referred to the 1960 issue of Exploration Review for an account of that Expedition and a description of the Island. Their programme of glaciology was based on the work done by the 1938 Imperial College Expedition to Jan Mayen. The studies of the 1959 Expedition were carried out on Sörbreen, the most accessible of the Island's glaciers and consequently the one about which most is known. Other glaciers were observed from the Expedition boat and by the Geologists from Birkbeck College.

The outcome of this work was a detailed report describing an advance of Sörbreen and giving evidence of a general advance of the glaciers of the Beerenberg ice-cap. Glaciers can be very delicate 'climatological thermometers' but they have a reputation for behaving in an erratic manner, advancing unexpectedly in times of general retreat. Analysis of meteorological data available for the Island showed a remarkable increase of precipitation in recent decades and it was suggested that this was the cause of the advance.

Above everything else this expedition proved the need of further studies on the geology and glaciology of the Beerenberg. F. J. Fitch, a Lecturer in Geology at Birkbeck College and Deputy Leader of the previous Expedition invited Peter Smith to join the Expedition he was planning, as Deputy Leader directing the glaciological programme. The scientific programme was ambitious but the organisation of the field work was such that maximum efficiency could be obtained. The Geologists and Glaciologists were to work hand in hand; the Geologists to help the Glaciologists with geomorphologic evidence of past glacial maxima; the Glaciologists to assist the Geologists with high level collecting work on the Beerenberg and within the crater rim.

The Expedition was blessed with fine weather on its arrival and progress was better than could have been expected. Then, we at home received the terrible news that five members of the Expedition, the glaciological team from Imperial College and J. F. Cole, had lost their lives when the Expedition boat had overturned in a fierce squall off the North West coast. It was with heavy hearts that we returned to the Island with Fitch, the only survivor of the accident, to complete as much of the glaciological programme as possible. Only now can we appreciate the amount of work these four eager men put into the first week of the Expedition.

Changes in the regime of glaciers — the balance between accumulation (precipitation) and ablation (melting) — are reflected by the movement of the glacier snout. When accumulation exceeds ablation for a number of years this may result in an advance. The 1938 Expedition found Sörbreen to be 930 metres from the sea, having retreated from its position of 1883, when it was observed by the Austrian Polar Year Expedition to be 80 metres from the sea. Aerial photographs taken in 1945 and



The Beerenberg from the south, Jan Mayen.

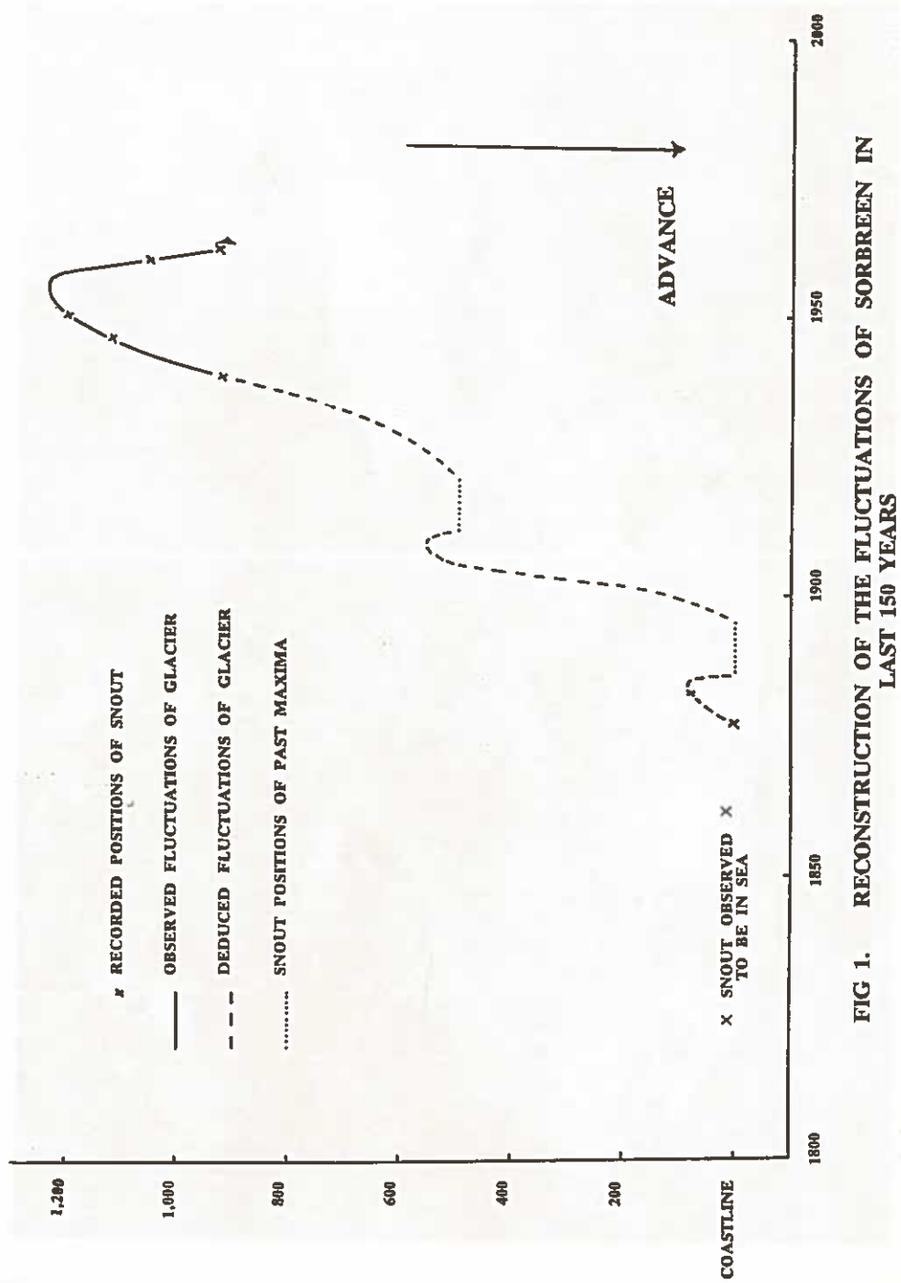


FIG 1. RECONSTRUCTION OF THE FLUCTUATIONS OF SORBREEN IN LAST 150 YEARS

1949 showed that the snout had continued its retreat to positions of 1130 metres and 1210 metres behind the coastline. In 1959 the retreat had terminated and an advance of 147 metres was recorded. This advance has continued and the 1961 determinations placed the snout 939 metres from the sea (approximately its position in 1938). Fig. 1 shows the fluctuations of the glacier diagrammatically.

We can learn more about the past limits of the glacier by studying the moraines built during previous advances. The most recent of these moraines are ice-cored and lie midway between the present position of the snout and the coastline. These may have been formed between 1883 and 1938 by a stagnation of the glacier, if not by an advance. They have been termed the inner lateral moraines.

A map of Sörbreen snout and outwash valley produced by the 1938 Expedition, shows the remnants of a terminal moraine just behind the present day beach. We must date their formation after 1876 (when according to the Norwegian N. Atlantic Expedition Sörbreen terminated in the sea) in the 10-year period following 1883.

The older moraines are massive by comparison rising to a height of 50-60 metres above the glacier and running down to the sea. Only the lateral moraines of the system are present, the terminal moraines possibly lying in the sea. These moraines have been provisionally dated at 1750, which is known to have been the time of a general maximum advance in the North Atlantic area. It should be noted that the present advance and the moraines described are general features of the glaciers of the Beerenberg ice-cap.

Measuring the position of the glacier snout does not tell us all we wish to know about the nature of the advance. This may be assessed by drilling lines of stakes into the glacier at various altitudes and measuring the strain (flow rate) after a time interval. In 1959, the remarkable velocity of 109.10 cms./day was measured for a stake line near the snout. This stake line was established again in 1961 and recorded a strain rate of 6.87 cm./day. This fits in with a recent theory on the mechanism of glacial advances that an advance takes place as a result of a kinematic wave travelling down the glacier from the accumulation area finally resulting in a rapid advance of the glacier snout. This advance takes place at approximately four times the ice rate at the snout. The average rate of advance for the period 1959-1961 has been 17 cm./day and the strain rate for the line of stakes nearest the snout in 1961 was 4.63 cm./day. This is in close agreement with the expected value.

We have seen something of the fluctuations of Sörbreen in the past and present and a little of the mechanism of the current advance. We must now seek the cause of the advance by consulting the meteorological data available for the Island. A meteorological station was established in 1921 and since that time records have been kept continuously except for a few months in 1941 and 1942 due to the war activities. A graph of the precipitation data plotted in Fig. 2 to show weather trends (not year to year variations) indicates that the precipitation has increased by 100% from 375 mm./year in 1925 to 750 mm./year in 1953. This trend is interrupted by a marked minimum in 1943. This is the largest increase of precipitation so far noted in the North Atlantic.

Following an increase of temperature to 1931, Fig. 3 shows there has since been a small decrease in temperature to the present, with an average temperature for the whole period near 0°C. Superimposed on this trend is a period of low average temperatures associated with the decreased precipitation in the early 1940's. In view of this association, the fluctuation of the weather pattern in the 1940's is not con-

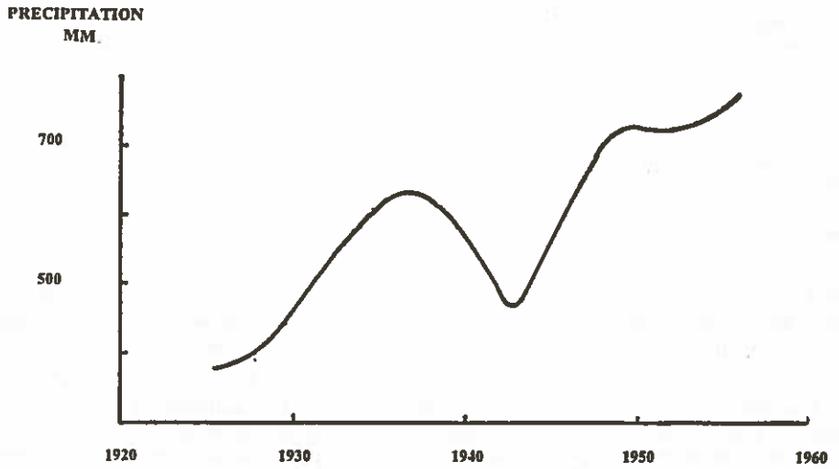


FIG. 2. SMOOTHED CURVE OF ANNUAL PRECIPITATION

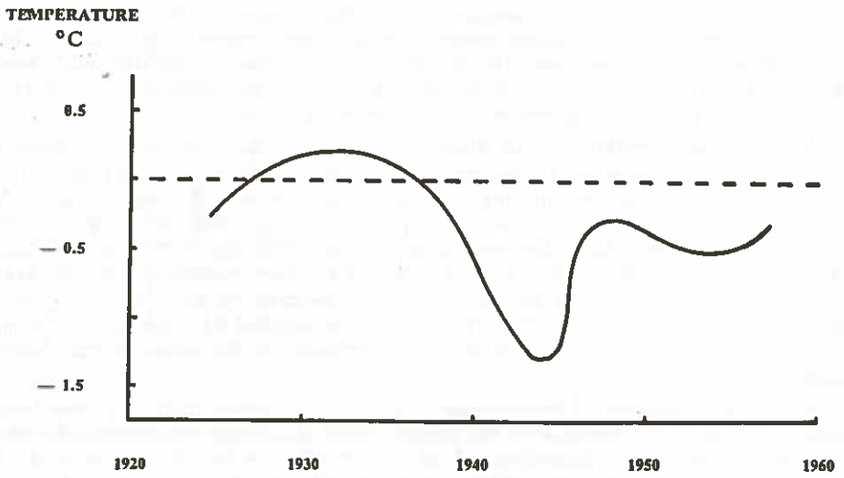


FIG. 3. SMOOTHED CURVE OF ANNUAL TEMPERATURE

sidered to have had a large effect on the regime of the glacier. The present advance of Sörbreen may, therefore, be correlated with the substantial increase in precipitation and a smaller, less important, decrease in temperature.

The next step was to discover the cause of this change in the weather pattern. This is where we enter the field of climatology. The turn of the century marked the beginning of a period of solar heating resulting in a rise of world temperatures. As would be expected, the heating effect was greater in the tropics than at the poles and an increase in the intensity of atmospheric circulation resulted between these zones. The increased circulation was also reflected in the strength of the ocean currents. The Gulf Stream had a scouring effect in the Arctic Basin and the thickness of the drift ice decreased due to its earlier break-up in the strengthened currents.

1941 is generally considered to have been the climax of the warming period. It is, therefore, somewhat of a mystery why the high level of precipitation has maintained itself. Data for other meteorological stations around the Norwegian Sea, which showed similar trends to Jan Mayen in the period 1920-40, now have a decreasing precipitation.

The high level of precipitation is correlated with an increase of cyclonic activity in the Norwegian Sea and with a decrease in the relative frequency of cyclones passing south of Iceland. Variations of the ice-caps of South Iceland may not, therefore, react in the same manner as the Beerenberg ice-cap. To date no advance has been recorded from southern Iceland but a maximum of Drangajokull, an ice-cap in North Iceland, occurred in the 1920's. This area of Iceland comes within the same pressure system as Jan Mayen. The advance of 1920 was also noted for other glaciers around the Norwegian Sea, notably in Spitsbergen and Swedish Lapland, but not in Iceland.

Readers may now be asking "what is the significance of the advancing glaciers of Jan Mayen and the changing climate of the North Atlantic?" To answer the first part of this question, if the reaction of glaciers to present climatic changes is known and fully understood, then it may become possible to apply this knowledge to previous times of glacial advance and elucidate climatic conditions when meteorological data was not or could not be recorded. This would assist Meteorologists in their ultimate goal of long term forecasting.

The climatic factor is mainly an economic consideration. The recent warm period has resulted in significant vegetational changes in the Arctic and sub-Arctic. The change in climate of this country has been less marked but has given farmers a longer growing season.

There is still much work to be done in Jan Mayen. The most pressing problem is to date various moraines with greater accuracy. This could be tackled with the new technique of lichenometry, a method by which the size of lichens is used to determine the date when their rock substratum became free of ice. It is also imperative that the future advance or retreat of the glaciers is followed and that other glaciological work done in 1959 and 1961 be repeated. Snowpits can be dug to measure directly the effect the increased precipitation has had on the accumulation of snow.

The problems are innummerable and we have the means to tackle them. To solve them will be the greatest tribute we can pay to our friends who lost their lives in pursuit of their solution.

Footnote: Since this article was written, further research has shown that it is more probable that the main terminal moraines were formed prior to 1883, between 1850 and 1870.

ÖKSFJORDJÖKULEN 1961

by Howard Lovenbury.

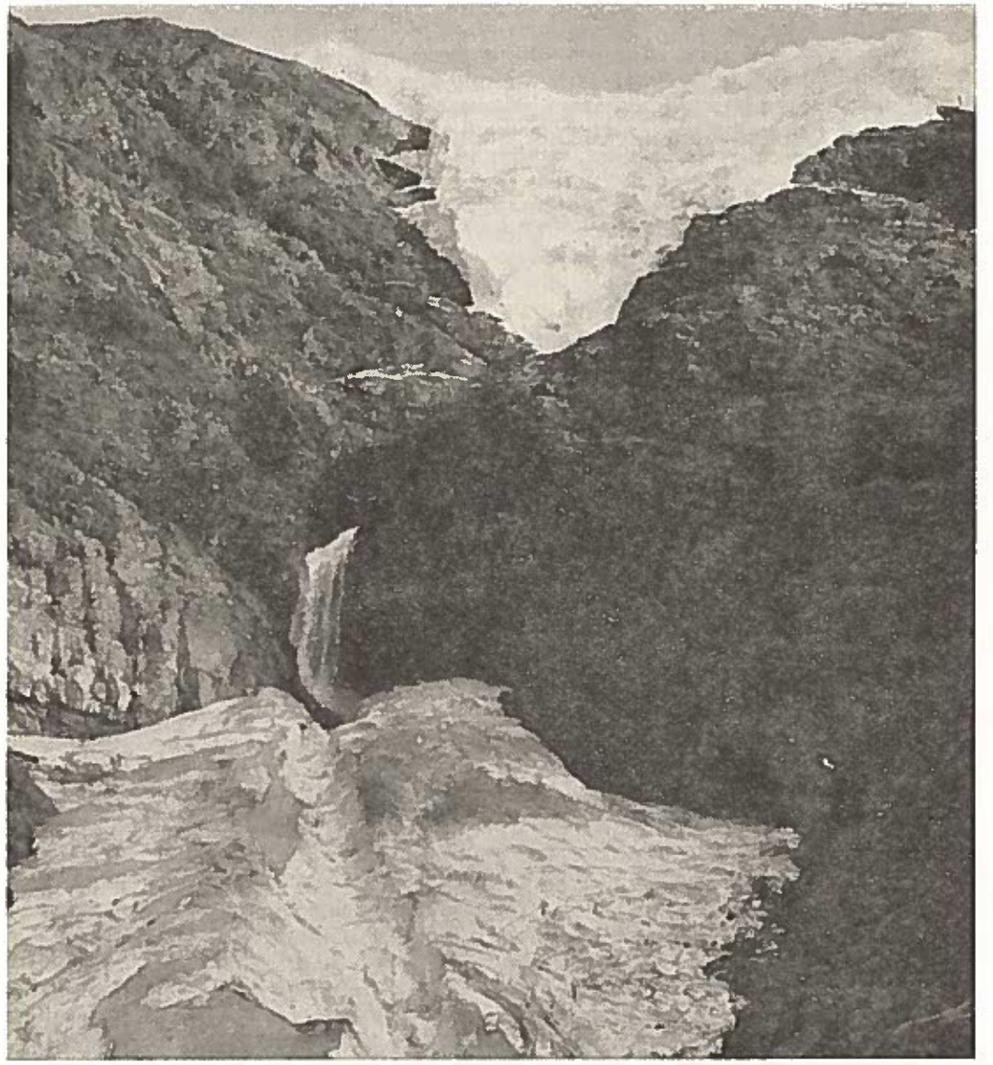
THE month of August was only two hours old. The day's work completed, we were returning across the ice-cap to our camp for a well earned meal and rest. Behind us, in the north, the gigantic yellow ball of the rising sun had lifted through the layers of low distant cloud, and was now slowly appearing above the summit dome. Gradually the gleaming rays of light moved across the ice and then, suddenly, encircled us. Our fatigue melted at the magic of the scene. The strong yellow radiance contrasted strangely with the long blue shadows cast by the small undulations in the crisp clean snow. All around us, the distant clouds were tinged with hues of pastel colours. Peaks, some clothed in a mantle of snow, stretched as far as the eye could see. It was as though it was our special privilege to be on "on the top of the world" to witness this superb sunrise.

Only twelve hours beforehand, we had crossed the ice-cap through dark, swirling mists, with the sole aid of a compass. The journey had been far from pleasant but it had been a necessary part of our task; miserably cold, in a blustering gale, there had been nothing to see but the man a few yards ahead. What a glorious compensation then was all this beauty. For the mountaineer, moments like these make up for all the hours of discomfort and toil. Too soon again we should be sunk in shadow as we pushed on towards our tents, still two hours away. We would be asleep by the time the sun rose over us again.

Michael Baker, Robert Nicholds, Bob Shroter and myself were four second-year students on an expedition to the north of Arctic Norway. Our excuse was to map the ice-edge of Oksfjordjökulen — pronounced *Irksfior-yerkerlen.* This ice-cap, which is seldom visited, is in the Bergsfjord peninsula, roughly mid-way between Tromsö and Hammerfest.

We had approached the ice-cap in a local fishing boat, from the south, up the beautiful fifteen kilometre long Jökelfjord, some three weeks before. At its head, which was flanked by sombre precipitous mountains sweeping straight up from the still water's edge, we pitched our base tent. This was placed on a patch of grass on a spit of terminal moraine. Our small patch of grass, however, was soon to spring into a veritable hayfield, and to be used as a grazing ground by the few reindeer who roamed in the vicinity. It was a most imposing sight. Two thousand feet above us a tumbled mass of ice was poised in a funnel-shaped gulley, ready to discharge over steep rocks onto the glacier several hundred feet below. It was for ever active as falls of ice came thundering down, the sound reverberating through all the mountains around.

The ice fragments from the calves collected on the regenerated glacier, Nedrebreen. This glacier in the form of a wedge, 800 feet high and of 30° slope, is composed entirely of particles of ice, varying in size from only a few inches to several



The regenerated glacier, Nedrebreen.

feet in diameter which have cascaded from the ice fall above. In effect, the rock cliff separates one part of the ice fall from the other.

To add to the uniqueness of this scene, a roaring melt-water torrent issued from the upper ice fall through a deep gorge, to emerge as a magnificent waterfall, before it again disappeared underneath the Nedrebreen. Sometimes the gorge would become blocked by the falls of ice, and the waterfall would quickly dry up. For a period of a few minutes, an uncanny silence would reign, to be broken by a tremendous roar as the ice dam was overtopped and swept away, and the swirling water, together with blocks of ice and boulders would surge out in all its majestic fury. The ceaseless activity of the wasting powers of Nature was here presented with remarkable impressiveness. This phenomenon took some time to get used to and never failed to hold our attention. In fact, owing to the incessant noise, we always found it difficult to sleep at base camp.

Although Nedrebreen no longer calves into the sea itself, it is by no means stagnant, and is still moving, as is indicated by crevasses in the most recently accumulated ice. Some calves from the upper ice fall still bound into the fjord, in evidence that this is the only glacier in Norway to reach the sea.

The accessibility of the ice has always made the glacier of commercial value. Before refrigeration plants were set up in 1949, both fishermen and fish merchants used to maintain a large fleet of vessels at anchor in the fjord during the summer months, waiting for the glacier to calve. When this occurred, thousands of tons of ice broke away and the ice was simply collected out of the fjord. So great was the demand for ice that an association was set up to supervise its collection. After 1937, when full-scale calving of the Nedrebreen ceased, the ice was even blasted out with explosives. To procure the ice was always a hazardous activity and many accidents occurred due to unexpected calves smashing or capsizing boats. Even today the glacier needs to be approached with caution and respect.

The ice-cap was perched on a plateau lying at a general level of 3,300 feet above sea-level. The whole area was deeply cut by valleys and fjords, resulting in very high relief. Oksfjordjökulen itself consisted of a central dome from which several small glaciers moved radially down into surrounding valleys. Its total area was about 35 square kilometres. Except in the south-west, the ice-cap was guarded by numerous sheer rock walls, many of them over 2,000 feet in height — and in the north, pinnacled knife-edged ridges thrust their way out towards the coast. The rock was rotten from extensive frost shattering and our progress was hindered by large boulders and coarse unconsolidated screes.

In Jökelfjord, scrubs of silver birches clung tenaciously to the more stable slopes but above one thousand feet, the trees gave way to rock and barren scree. As the head of the fjord faced south, it was a sun trap. The flowers grew so profusely there that it would have been a paradise for botanists. When we first arrived, in the middle of a heatwave, winter was just passing away and spring was already flourishing in its place. Large drifts of snow still stretched down to sea-level — but clumps of mountain flowers were already out in their vivid glory wherever we ventured. But within a fortnight most of them were over, for such is the short duration of spring in these latitudes.

Luckily we were soon able to find a moderately easy route up onto the ice-cap which enabled us to establish an advance camp on old moraine close to the ice

edge. The route was only termed easy because it involved no real rock climbing, but it was no walk at any time, least of all when carrying a 50 pound pack. We pushed our way up through scraggy birches, toiled up steep laborious screes, so unstable, that stones rocketed to the valley far below as soon as we stepped on them, clambered over huge boulders, and then stumbled over loose piles of shattered rock, on to the moraine. This camp was our upper base and we used it continuously for the survey. We were able to reach any part of the ice-cap that was within a day's excursion of it. As it had to be kept stocked throughout we had to return to base camp once a week to collect supplies.

According to records, only a few people have visited the ice-cap before. Amongst these was the eminent Scottish geologist Archibald Geike who travelled up Jökelfjord in 1865. The first person to reach the ice edge was an Englishman G. Hastings in 1898. The only map that existed of the area was produced in 1893 to a scale of 1:100,000.

The aim of our expedition was to determine the present size of the ice-cap, for the Norwegian Polar Institute. This was achieved by providing the ground control for a set of vertical aerial photographs flown over the area in 1945. We established this system of control by erecting a series of intermediate stations around the ice edge from four existing trigonometrical cairns. This control can serve as a datum from which future expeditions can readily observe any change in the position of the ice edge. In the field we used a Hilger and Watts Microptic No. 1 theodolite, fitted with a bridge to hold a Zeiss Nettar 2¼″ x 2¼″ camera. Besides the angles which we measured at each station with the theodolite, we took a photographic round with the camera to secure a permanent record of the ice boundaries. (We are producing the final map on a radial line stereoplotter to a scale of 1:25,000 and the present limit of the ice edge will be sketched in from the photo-theodolite rounds.).

Two weeks were spent in preliminary reconnaissances and in setting up our advance camp at 2,400 feet, after which we were able to devote our whole time to the survey. We built our cairns on nunataks[1] or ridges close to the ice edge. These sites were covered by heaps of frost shattered debris, criss-crossed by numerous rotten dykes — but seldom were the fragments of rock of suitable shape or size for really stable cairn construction. Cairn building, like dry stone walling, is a skilled craft acquired only after years of hard experience. No wonder then that some of our cairns behaved rather strangely. Five hours spent observing from one of these stations was always cold and often cramped work — we were very glad of our down jackets. When observations would not agree because of some small movement of the cairn, the work became all the more trying. Stone polygons abounded on these summits and the only vegetation consisted of lichens, which were sometimes growing with mosses. One of our aims was to make a collection of these lichens from every station — and we found over 35 species.

Travel across the ice-cap during the day was often arduous. We were always roped together and wore crampons. During the first month there was usually sufficient snow cover over the crevasses for them to be safely crossed, but later

[1] Rock masses entirely surrounded by ice and snow.

on we had to weave devious routes amongst them. Where the ice was runnelled the going was firm and fast, but in other places the ice turned to slush.

The main accumulation area of the ice-cap was a large central dome from which five ice basins branched out. They were all badly crevassed and in some places we came across crevasses 20 metres wide. The ice architecture of the southern ice fall was magnificent — séracs, towers, spires and ridges piercing the sky above, and vast chasms reaching to unfathomable depths below. In comparison with neighbouring ice-caps Oksfjordjöku.en has retreated far less than might be expected. The edge of the ice is mostly defined by the perimeter of sheer rock faces that guard it — and instead of contracting in area it seem likely that the ice has been mainly decreasing in thickness. That several of the nunataks have become larger and that in some places new nunataks have appeared, confirms this.

The midnight sun is a great boon to the surveyor in Arctic regions, although until one becomes accustomed to it, continuous daylight can be rather unsettling, and certainly makes it more difficult to regulate one's day. Without it some of our journeys would not have been possible. Sometimes we were out for twenty hours at a time to get a job done; we cou.d never have done this if we had not known that we could get back at any hour. This we were able to do up to August 19th. With the survey completed, we all returned to base camp for the last week, where we completed a plane table survey of Nedrebreen.

In this peninsula, the small resident population is confined to isolated fishing villages in the fjords. In Jökelfjord, the houses straggled for several miles along its length. Once every fortnight we used to walk down to the post-office in order to maintain contact with the outside world. The occupations of the inhabitants are still farming and fishing. However, they are we.l supplied with civilised needs. A new road, which joins the fjord with the Arctic Highway has just been constructed. and every house has a supply of electricity. Even television is on its way!

The children are educated at Tromsö and spend a lot of their time away from home. They find the peaceful way of life of their parents too dull, and long to drift south. Jökelfjord may be beautiful in summer but the long winter darkness is harsh.

The local people were unable to understand our desire to visit their ice-cap and to climb their peaks. The cairn we placed on Skalsatind caused great interest — boats would often come up the fjord to stare at us out of curiosity. Their memories of the ice were bitter. During the war the Germans had razed their homes to the ground, and they had taken shelter for the whole winter beside the regenerated glacier Nedrebreen — of which the Germans were afraid.

We saw little of the Lapps during the expedition because they do not venture on to the ice. They move into the peninsula for the summer months from their wintering home on the Swedish border, and still continue their rugged existence for fear of losing their identity. But civilisation has touched them — cigarettes. gold watches and outboard motors were characteristic of their possessions.

The weather on the whole was better than we had expected. Our arrival was heralded by a spell of gloriously hot sunny weather which lasted for almost two

Continued on page 30.

Physiological Research On Expeditions

by

I. F. G. Hampton, British Antarctic Survey.

EXPLORATION of the remote areas of the world presents a challenge to the body as well as to the spirit. Reference to the classics of polar literature from earliest times reveals many comments of physiological interest, yet the history of physiology as a science playing an important part in the research programme of an expedition is contained in little more than a decade. So rapidly has physiology come into prominence that today it can be responsible for launching an expedition, instead of following in the wake. A study of the development of physiology as an expedition science illustrates the role it plays and leads naturally to a consideration of the factors involved when planning field work.

The war gave the initial impetus to the development of physiology as a science suitable for field work. Previously research workers had been content with investigating the complexities of the human body in laboratories, where conditions could be rigidly controlled, and cumbersome and complex equipment was no handicap. However, it was soon realised that the results so obtained may bear no relation to the man's behaviour in the unusual circumstances often dictated by war. In the final analysis the effects of 'g' at high altitude in aerial combat, and snow warfare at subzero temperatures can only be examined in those conditions. It was thus necessary to invent new techniques, new equipment, and in the process it became clear that a proper understanding of basic physiological processes was necessary before behaviour under extreme conditions could be examined and predicted.

After the end of the war, it was natural that the energy and resources bequeathed by it should be directed towards expeditions and the extreme environmental conditions in which men voluntarily place themselves. By now the organisers of expeditions had realised that physiology had something positive to offer to an expedition. Physiology was not merely of academic interest; it could help with the logistics of planning by suggesting food and fluid requirements for a given set of conditions, or prescribing the optimum combination of protective clothing for a given cold stress, and so on. The standard British polar rations have evolved as the result of many years of experience. In recent years, however, measurements have shown that the rations are deficient by about 1,000 cal/day for strenuous journeys. This deficiency can account for the marked loss of weight frequently observed on these journeys and the possible loss of efficiency as a scientific team which may result. As a result it is now common for modern expeditions to provide air support for sledging parties so that they do not have to cut rations to a minimum because of weight considerations. Whether this facility improves the quality of the results remains to be seen!

As more of the earth's surface becomes known, so the need to place all an expedition's resources into a single journey of discovery disappears. Accordingly, more time can be devoted to specialist activities and as more is learned of man's behaviour in a given set of circumstances the greater will be the benefits mentioned before, quite apart from the academic interest the results will have.

Advances in other fields have helped physiology in its development as an expedition science. Probably the most important of these is electronics. In the days before

the war the physiologist had to be content either to remain in the base hut with bulky instruments or confine himself to research that could be done with a thermometer and a pair of scales. With increasing knowledge and application of the properties of semi-conductors, by the use of printed circuit techniques and the advance of micro-engineering to name but a few, the physiologist is given tools enabling him to be much more ambitious and plan research that formerly would have caused much inconvenience and discomfort.

It is now possible to measure temperatures with thermistors applied to the surface of the skin, thus removing the necessity of penetrating the skin with thermocouples, and to record several such temperatures continuously on a small device weighing only a few pounds. The measurement of energy expenditure no longer requires the use of a large canvas bag to collect expired air. Using lightweight apparatus and a small mask the volume of expired air can be measured automatically together with the collection of small samples for analysis. Under certain conditions the results can even be telemetered over moderate distances. By swallowing a small pill containing a radio transmitter it is possible to follow changes in the internal body temperature, pressure or pH by the changes in the emitted frequency — a process which involves no disturbance of the subject whatsoever. Many pieces of quite sophisticated apparatus are now capable of miniaturisation so becoming portable and self-contained and requiring few facilities for their operation.

Compared with the older established field sciences of geology, glaciology and topographical survey, physiology has until recently suffered from the fact that experimental techniques and lines of research have not been freely available to all who wish to use them. This condition is swiftly being removed by the interest shown in expeditions by the Division of Human Physiology of the National Institute for Medical Research at Hampstead. The interest began with the assumption of responsibility for the physiological work performed on the British North Greenland Expedition and with Dr. Pugh's work on the 1953 Everest Expedition. The zenith was reached with a physiological expedition to the Himalayas, last year which wintered above 19,000 ft. The British Antarctic Survey (formerly F.I.D.S.) which maintains eight bases permanently in the Antarctic also relies upon the Division to sponsor and direct the research work of its physiologists and medical officers.

To date, the expedition activities with which the Division has been concerned have been confined to polar regions and high altitudes. A wealth of experience has accumulated and many members of the staff have considerable knowledge of extreme field conditions. The laboratories at Hampstead are provided with excellent climatic chambers, and for several years the main interest has been directed towards problems of heat acclimatisation, although this has not yet been applied to expeditions of the type visualised in polar regions. Also at Hampstead is the Bio-engineering Unit which has produced the ingenious instruments mentioned above.

The advantages presented to a person who wishes to do physiology on an expedition are obvious. There is a department geared to the type of work, an experienced staff able to offer advice, facilities for planning a programme, and climatic chambers where pilot experiments can be performed to remove unsuspected difficulties. Not least in importance is the advice offered for tailoring or constructing instruments to the expedition physiologists' own particular requirements.

Several general principles concerning the conduction of physiological observations on expeditions have emerged over the last ten years. On an expedition a phvsiologist is often very much alone with no library for reference purposes and possibly no

one with whom he can discuss his problems. No two human beings are alike and identical experiments performed under similar conditions on two subjects at the same time, or on a single subject on successive days can give widely varying results.

In cases like these the interpretation of results is very difficult, but it is made easier if the trouble has been taken to plan the experiments carefully, and to become thoroughly familiar with all aspects of the subject of investigation. Seldom will a physiologist have no idea of what he is looking for, and what form his results will take. A preliminary discussion with a statistician during the early stages of planning will always help in the analysis of the results when they are obtained. An understanding of the number of subjects required, the frequency with which experiments must be performed and the number of observations required can save much of the regret and frustration often found when a series of carefully planned experiments are ready for analysis. It may well be emphasised here that results which do not lend themselves to statistical analysis have little real meaning. A knowledge of statistical methods enables the results to be followed as they are obtained and can be a great help in revealing unprofitable lines of research, or interesting offshoots.

A corollary of these remarks is the necessity for becoming familiar with the relevant literature before the expedition leaves, and not when the results are being written up. If this has been done, anomalous results are not so puzzling and perhaps suggest that modifications in technique are required. A field trial is often a great help, in revealing errors and omissions not obvious on paper and should always be performed before the expedition gets into a position where rectification of the mistakes is impossible.

Even assuming that a great deal of thought and hard work has gone into his preparations, the physiologist is not really in a position to relax until the expedition is over. As far as the subjects are concerned, physiological research is often inconvenient and sometimes unpleasant. To remove resentment at being 'interfered with', and replace it with co-operation requires the utmost tact. Occasionally the measurements are felt to be an invasion of privacy, the subject feels that a dossier is being compiled and filed away for future reference. Fortunately most people respond to a logical explanation of the work and the reasons for it, together with enthusiasm; and if the results are made immediately available in the form of a chart or diagram feel part of something worthwhile.

If the results are pinned up on a notice board every one can see them, discuss them, and draw their own conclusions. Often the comments of these unbiased observers are extremely rewarding, and offers of help in a practical way are not uncommon. The interest can become embarrassing at times, when the hefty members of the expedition go into training for the day when routine body weights and fat thickness are measured.

During a recent discussion of physiological work in polar regions a well known personality remarked, "It looks as though physiology has come to stay." Through advances in techniques, a greater understanding of the problems involved and improvements in instrumentation, together with co-ordination and a means of disseminating experience, physiology can now take its place along with other sciences on an expedition. As a concluding note it must be stressed that all the work must be written up, even if the results seem negative or inconclusive. Only in this way can future expedition physiologists avoid making the same mistakes and pursuing the same unproductive investigations.

The Tragic Loss of Five Men on the 1961 Beerenberg Expedition.

by Frank J. Fitch.

A PARTY from Birkbeck and Imperial Colleges visited Jan Mayen in the summer of 1961, in order to continue geological mapping and glaciological studies initiated on previous expeditions to the Beerenberg volcano (71°05′, 8°10′ W). The ten-man advance party that sailed from Inverness in a chartered Norwegian sealer on the 10th June included Frank J. Fitch, leader, and Peter Smith, deputy leader. Peter Smith and his three companions from Imperial College formed a glaciological research team. Their first task on Jan Mayen was to begin a detailed study of the large glacier Sörbreen, on the southern flank of the Beerenberg. At the conclusion of this initial work they were to join the rest of the party on the north ridge for a combined assault on the summit, crater wall and ice-filled crater of the mountain

On Sunday, 25th June, Frank Fitch and Jack Cole brought the expedition's motor boat, "Arctic Fox", south to meet the glaciological team at Jan Mayen Radio, some 15 miles from the northern Base Camp at Krossbukta. The six members of the expedition (F. J. Fitch, P. Smith, J. D. Booth, J. F. Cole, J. R. Fraser and C. M. Smith), who boarded the motor-boat that evening to return to Krossbukta, were in high spirits at the successful conclusion of the first phase of their scientific programme. All were wearing nylon protective clothing and life-jackets. The motor-boat was a specially made unsinkable fibre-glass quarter-decked dinghy, of a type used by the Falkland Islands Dependencies Survey in the Antarctic. It had been used in Jan Mayen waters before, in 1959, and since then had been equipped with a second independent outboard motor and with extra spray canopies. Extensive trials in the Thames estuary, and continuous use in rough weather during the previous ten days on Jan Mayen had given all members complete confidence in its seaworthiness.

The weather appeared fine and settled on departure from Statjonsbukta at 1900 hrs. G.M.T. The sun was high in a cloudless sky (25th June is during the period of continuous Arctic daylight), and the sea was calm. During the first ten miles of the journey conditions were perfect whilst the party sailed close to bird cliffs taking cine and still photographs of the great colonies of sea birds for which Jan Mayen is famous. Tragedy struck unexpectedly near a point called Vakta, just south of the main north coast glaciers. A violent catabatic wind suddenly swept down from the mountain and caught the boat in a maelstrom of swirling water. A chance breaker unluckily swamped and stopped both outboard motors simultaneously, and as the oars were being unshipped, another large sea capsized the boat without warning. Everyone floated up in their lifejackets. Fitch ordered them to abandon the wreck and swim for the shore, which was not more than 100 yards away. He began to help Jack Cole, who was the poorest swimmer in the party. At first they appeared to make little progress against a strong longshore current, but after shouting out further encouragement, Fitch continued swimming with Cole holding on to his back. The water,

close by the glaciers, must have been very cold, possibly only 28°F., and Cole's grip weakened until he was washed away by the still angry seas. Unable to find him, Fitch was forced to continue swimming towards the beach after the others. When his arms became frozen he swam on his back until he became unconscious. The next thing he was aware of was being washed up and down in the surf. Half paralysed and breathless, he dragged himself out of the waves, expecting to find some of his companions ashore. After some time, when he could stand up, he could see no sign of life or wreckage. Believing the current to have carried everyone south, he crawled to the top of a low bluff overlooking the sea, but could still see nothing. All was calm and peaceful again. Not willing to assume the worst, Fitch reasoned that the others must be on the inaccessible beaches below the high cliffs to the south, and that he must get ropes to help them as soon as possible.

The ten mile traverse of the flank of Beerenberg, from Vakta to Jan Mayen Radio, across moraine, ice and lava flow, virtually in bare feet (he had kicked off his sea boots in the water), took him just under six hours. Search parties set out immediately on his arrival at the Radio Station at 0420 hrs. on the 26th. Led by Finn Jensen and Torstein Raaby, these parties discovered the wreck of the boat under the high cliffs, but no trace of the remaining members of the boat party. A further search of the beaches carried out by the Norwegian frigate GARM on the 28th revealed no further evidence until C. Martin Smith's body was recovered at sea, floating in his life-jacket. It would appear that the men who lost their lives froze into unconsciousness rather than that they were drowned. Fitch returned to the UK via Iceland with the body. Only one other body was recovered, that of J. F. Cole, discovered amongst the rocks near Base Camp on the 14th July. Cole was buried on Jan Mayen and a memorial plaque to all the lost men was later erected behind his grave at Krossbukta.

After a period of uncertainty, it was decided to make every effort to complete the scientific programme of the Expedition, particularly those parts begun by the lost men. The remainder of the advance party, and a second geological party (including one Imperial College student), continued with the geological mapping and more general parts of the programme. In order that the work on Sörbreen should not be wasted, Fitch returned to the island on the 8th August with three new members, two of them glaciologists from Imperial College. During the next fortnight a vigorous effort was made to complete some essential parts of the glaciological programme as originally planned by Peter Smith. The work on Sörbreen was completed on the 13th August, and the Beerenberg was successfully climbed on the 14th. Before the Expedition returned to Inverness in its ship SIGNALHORN, the 1: 10,000 geological mapping had been extended over most of Nord-Jan, and striking confirmation had been obtained of an ice-advance that is now being shown by all of the Beerenberg glaciers.

Since our return from Jan Mayen, considerable thought had been given to the position of the motor-boat in our original programme. There are no harbours on the island, and all landings must be made from small boats. Landings from ship's lifeboats can only be made in absolutely calm conditions (as was demonstrated by the loss of one of the SIGNALHORN'S boats on the beach on our first arrival at Jan Mayen), and it is therefore necessary to possess a small boat, capable of being drawn up on the beach through the surf, if an expedition is to land at the places required. Thus for any landings north of the main glaciers, a small boat such as we possessed is essential. In restricting its use to 100 yards or so off the shore in fine weather

conditions, and insisting on every passenger wearing protective clothing and a life-jacket, we thought we had reduced the dangers inherent in its use to a minimum. The further precaution that we suggest future expeditions should take is the retention of their supply ship off shore at all times when small boat work is contemplated, to guard against the unpredictable changes that can occur in the local weather conditions around large ice-covered mountains like the Beerenberg.

In Memoriam

JOHN DAVID BOOTH Brian Manton writes... "John Booth whose face was to become so familiar to many of us, was first seen in Imperial College in 1955 when he entered on a State Scholarship from Harrow Grammar School. He took first class honours in Civil Engineering, and stayed on carrying out research in structures for a Ph.D.

"In 1958, the Governing body of the College awarded John an Exhibition to attend the British Association annual meeting, and in the same year he was awarded a Medal and Premium by the Institution of Civil Engineers for a paper 'The Channel Tunnel'.

"John was awarded Guilds Social Club's Colour as chairman of the Engineering Society. He belonged to the dancing club — ran in college cross-country matches — climbed in the Alps as well as in Wales, and yet found time for an active interest in College functions.

"To find a man of like versatility is unusual. Add unselfishness and humility and a grand but rare person is discovered. Such a one was John, and his passing is a great loss to the community. May his example live in our memories for years to come."

JOHN ROBERTSON FRASER graduated at Edinburgh University with second class honours in Civil Engineering after leaving Kirkcaldy High School. He worked for two years to gain practical experience, and was then appointed a research assistant at Imperial College and was studying the behaviour of arch dams for a degree of M.Sc. (Eng.).

Neville Mann writes... "I first met John through the London Mountaineering Club, of which he was an extremely active member. Among the members of the club he had a considerable reputation for his energy and enthusiasm as an all-round mountaineer. As training for his Spitsbergen Expedition he covered the Welsh fourteen 'Three thousanders' with no form of support or transport, returning to the club hut in the Llanberis Pass on foot. He was then, certainly a man of action, and as a person with a great love of all sides of mountain craft.

"John's manner however, which was mild, modest, and reserved gave very little hint of these qualities. I remember, especially after his return from Spitsbergen, his

modest account of their work in Dicksonland: I later heard from members of the Cambridge Spitsbergen Exhibition of 1961 that the survey work had been of a very high standard obviously incurring a great deal of arduous back-packing in the field. This, I feel, was very typical of John. Others who met him were struck by his mild and charming manner coupled with a dynamic and lively character."

CYRIL MARTIN SMITH was working for a Ph.D. in organic chemistry. Anthony Quinsee writes.... "Cyril Martin Smith — always know as Martin Smith — was in every respect a 'whole' man. His interests were wide and intelligent, and his hobbies pursued with enthusiasm and effect. Martin became a chemist and obtained a 'first' with enviable ease. He then interrupted his studies to 'see a bit of the world' as he put it, and spent two years in Antarctica with the Falkland Islands Dependencies Survey before returning to I.C. to study for his Ph.D. Whilst in the Antarctic, Martin developed the interest in photography and nature study, which resulted in his films of some never-before-recorded aspects of bird life earning wide recognition on his return to England. This love of wild life led Martin to seek every opportunity for travel; he spent many weekends climbing in North Wales (whatever the weather) and the summer before last he joined the Spitzbergen expedition only a short time after returning from the Antarctic!

"But the outdoor life was not all-in-all for Martin. As a scientist he had a sensitive awareness of the arts which prompted him to ask many questions on literature. Above all, he had a wonderful ear for music. This meant so much to him that on reaching Port Stanley in the Falklands he contrived to have an old piano taken on the ship and unloaded at base, so that he could keep up his practice. His playing was a delight to hear: he had certainly inherited the family talent manifest in his uncle, Cyril Smith.

"Martin was a delightful companion and a friend; with so lively a mind he could never be dull, and by everyone who knew him he will always be remembered — for his conversation, for his vitality, for his music: for the whole man which Martin Smith was".

PETER SMITH came up to I.C. on a Lancashire County Scholarship from Heywood Grammar School in 1956, obtained his degree in civil engineering in 1959 and was awarded the Faber Prize in the same year. In 1960 having obtained a Rees Jeffreys Road Fund Bursary he gained a D.I.C. in Highway Engineering.

His spare time was literally crammed with college clubs and committees, but though all benefited from his cheerful banter, keen argument and physical presence none received so much of his enthusiasm as the Exploration Society, of which he was president three years ago.

Pete was no mere theoretician. Except for the first, which he spent erecting pylons and climbing in Skye, he used all his summer vacations to go on expeditions. He was the backbone of the organisation of all of them, and as one expedition was finished he started planning the next — in 1958 surveying raised beaches in Eastern Iceland — in 1959 doing glaciological work in Jan Mayen — in 1960 to Spitzbergen — enjoying every minute and thriving on the hard work involved.

He thought the small expedition, well within the capabilities of its team of perhaps four, and may be only partially scientific, the most gratifying. The Spitzbergen venture on which he got to know John Fraser and Martin Smith who went with him to Jan Mayen this year, was just to his liking.

He must have passed on his enthusiasm to many people, and if they in their turn can continue the work he started, a great many worthwhile expeditions will be going out under the aegis of I.C. His confident inspiring presence on the hills will be missed by some few of us, but his memory will stay with a great many for ever.

Geoffrey Topping.

A Literary Agent Looks at Expeditions . . . continued from page 11.

case of a photograph—unless these actions were carried out in the general course of one's normal employment. Thus, where a photographer is employed by a newspaper to take pictures and he does so during his working hours or on an assignment for the newspaper, the latter is the owner of the copyright. One equitable way of dealing with expedition copyrights, particularly over photographs, is to lay down that for a limited period, say three years from the date of the expedition's return, the copyright is assigned to the expedition itself and thereafter reverts to the individual. In any event, it saves much argument and heart-burning to sort out these points in advance, when any thought of surplus and profit-sharing is academic.

This article is a "once over lightly" and merely deals with some of the salient factors of expeditions from a literary agent's viewpoint. Let me conclude by saying that, although the pressure of competition is making it more and more difficult to sell a small expedition's wares, I am always very glad to meet leaders of forthcoming expeditions from your College, listen to their plans and help them if I can.

John Farquharson Limited, 15, Red Lion Square, London, W.C.1.

Oksfjordjökulen 1961 . . . continued from page 22.

weeks, and was so hot that we could scarcely sleep at night. After this survey was interrupted at intervals by periods of rain or low cloud. Sometimes we were tent-bound for two or three days at a time — but when the weather did clear up we were at least certain of two magnificent days. The weather was always extremely local.

By the beginning of September we had over eight hours of darkness. It became much colder, with heavy frosts at night, and snow began to fall above 1,200 feet. It was now that we had a chance to see the magnificence of the aurora borealis. It appeared in an arc over the fjord as a fluted band of green fluorescence that changed continually as the brilliance flickered to and fro along its length. Already we could sense the approaching winter already covering our mountains with its thin white cloak. Even the birch leaves were turning yellow to remind us that it was time to leave.

As we chugged our way down the fjord for the last time we realised with a deep sense of satisfaction tinged with regret that the expedition was over; we had broken away from civilisation for over two months. Such a glorious day! Should we ever return to this little corner of Scandinavia that we had come to know so well?

The Malta Expedition, 1961

by John D. Woods.

"Roman wine ship discovered at Gozo."

" . . . . . Dives made by the Imperial College team to the foot of the reef have now shown that there are probably three distinct wrecks and that the reef mentioned is a flat platform 150 yds. by 50 yds., at an average depth of 40 ft. and dropping sheer on all sides to a sandy bottom 200 ft. below the surface. . . . . "

(extract from Press notice No. 3, dated 1st August)

This despatch was written during our fourth week in Malta. The three weeks since our first day on the island had provided many opportunities for us to learn about the island group and its population, to confirm some of our expectations and dispel others. In London we had studied Admiralty charts and aerial photographs of this group of limestone islands, together slightly larger than the Isle of Wight. Apart from the mainland of Malta, with its multitude of military bases, we were fascinated by the slightly smaller Gozo, the legendary Isle of Calypso where Odysseus was kept "a willing prisoner" for seven years after the fall of Troy, and lying between these two islands, the uninhabited Comino and Cominetto. (The fifth island of the group, Filfla, is a seldom visited rock, only a few hundred yards across, and used nowadays for aerial and naval target practice.

The focus of the island group is Valletta. This impregnable citadel was built in the 16th century by the Knights of St. John on a peninsula that juts out into the Grand Harbour, dividing it in two. Here the main part of Malta's 300,000 population concentrates in suburbs round the docks, while the wealthy business community has its offices inside the city (and its luxury houses in the fashionable Sliema suburb). Here all is British; the inhabitants still delight in imitating the Edwardian customs that were so frightfully British, but are now found only in the remote colonies and protectorates.

As we left Valletta for the smaller villages and towns that cover the island it was obvious that this wealth also reaches the other inhabitants. The poverty that the Land Rover party had seen on their way through southern Italy is seldom present here, where many families own cars (and what cars!), television sets, and many of the luxuries that the Italian peasant never sees. No crowds of children besieging the rich Inglesi for cigarettes and sweets here. Although we often thought that the population had its order of priorities badly inverted (for example the "diversion" of a government grant for new sewers in Birkirkra, to pay for a new church roof — not to mention the massive Fiesta celebrating its completion), but the basic essentials are seldom missing and in the care taken by the Maltese of his animals, vehicles and children (in roughly that order) he far surpasses his Italian counterpart.

So far as we could make out, the islanders completely lack any concept of melody, and have no traditional music at all. In their unrestricted ringing of church bells, the requirement appears to be to achieve the maximum intensity of sound, "frightening away the devil" (as our Maltese camp guards assured us) with the minimum of melody, "for fear of attracting him"; we came to the conclusion that the Maltese are incapable of melody anyway. As if the din of church bells is not enough,

each village owns its set of mortars, designed to fire vast fireworks high into the air, where they explode with, as it seems, the minimum of illumination, but the maximum of noise. These monsters are exploded day and night in celebration of the Festivals of each successive saint; as, of course, each day boasts at least one saint, there is throughout the island a continuous background of bangs which one comes to accept rather as the Londoner accepts the background of traffic noises. Occasionally on the more important saint days, the inhabitants will modulate the noise of the firework display with a visual spectacle of unexpected quality and proportion. Then, even the smallest villages provide a display of firework skill, that goes far beyond anything seen in England, and we soon realised that visual art is the main form of Maltese expression. The brilliant embellishment of boats following the traditional Mediterranean pattern, and the extension of this treatment to cars and buses caused us much pleasure. For although the results are often crude and naive to our eyes, they add a much needed splash of colour to this otherwise drab limestone island, so lacking in trees and other greenery.

The first four weeks of our stay on this island of contrasts were spent in the South-East, near Marsaxlokk, a small town situated on the edge of the Marsa Scirrocco Bay and the centre of the island's fishing industry. Half a mile away stood the R.A.F. Marine Craft Unit on whose ground we pitched camp, just a hundred yards from the diving boat, anchored with the great forty-knot launches of our hosts to one side, and the brightly coloured fishing fleet to the other. Also visible from our camp site was the great square of St. Lucian's Fort, built by the Knights in the 16th century and today used by the Air Force. During these early weeks we used to set out in the boat, a thirty-foot cabin cruiser, after an early breakfast for the day's diving in the Bay (over two square miles in extent) or on one of the two great reefs at its mouth.

The expedition had been planned jointly by the Imperial College and the Institute of Archaeology as an experiment, an attempt to associate the archaeologist, the technologist and the diver with the ultimate intention of developing satisfactory techniques for archaeological excavation under the sea. We had spent two years preparing plans and equipment for this expedition before finally deciding in November 1960 that our working site should be Malta. We knew that Malta had been used for over three thousand years as a military base by each successive Mediterranean power, and despite the scarcity of documentary evidence from before the 16th century, we were convinced that the magnificent natural harbours had been used by Phoenician and Roman fleets just as they had by the Knights and Moors later. The uninviting climate coupled with the island's reputation as a military base had satisfactorily dissuaded all but the hardiest of tourists: so here was a virgin coastline unravaged by the tourist diver, and promising many hidden treasures for the serious worker. Our party of ten (nine divers and a cook) set out in two groups, four leaving by Land Rover towing all the expedition equipment in a trailer on a route that included the capitals of France, Switzerland and Italy, followed by Siena and Naples, and finally the "Star of Malta" from Syracuse to Grand Harbour. The remaining members of our party travelled in the comfort of a BEA Vanguard arriving in Valletta seven hours after leaving London, to meet the land-rover party that had taken as many days over the journey.

It is almost inevitable with exploratory expeditions, such as ours, that luck should play a large part in the successful outcome of the project, and so it was with us. The first three weeks were spent on a series of projects aimed at both raising our standard of diving, and trying out new techniques. These days were occupied diving

at locations within easy reach of our camp site, that back in London we had listed as being most profitable for investigation. The archaeological results from these were most disappointing; we found absolutely nothing of interest, despite the occasional raising of false hopes. One positive result from these early days was the completion of a series of botanical "scrapes" from an underwater cliff fifty metres deep. This, and the collection of shells for the British Museum make up the tangible results of our stay at Marsaxlokk. Although these collections are now proving of very great interest in London and were very well worth making, they were not the prime object of our expedition, so my account must proceed with the archaeological aspects of our diving.

Our luck, which we thought had deserted us, now proceeded to make amends for the disappointments of Marsaxlokk, thanks largely to the Royal Navy. Unmistakeable signs of an ancient wreck were discovered on a reef in Gozo by a couple of naval spearfishermen on leave. In the remaining few days of their stay in Gozo they were able to raise several pieces of pottery which were identified at the National Museum in Valletta as being of early Roman origin, circa 3rd-2nd cent. B.C. This first evidence of archaeological remains under the sea at Malta was found just ten days before we landed on the island! The original finders were stationed at the Fleet Air Arm base just across the Bay from our camp site, so we lost no time in contacting them, and four of us accompanied them one weekend, diving on the reef to inspect the wreckage. That very week-end we raised what was to prove the first of many amphorae. The next two weekends were spent in similar visits with the naval divers, just four of our party going each time, while the remainder carried on the diving at Marsa Scirrocco. It soon became obvious, however, that our dives in Gozo were becoming progressively less productive, largely due to the lack of a plan of the reef (even the Admiralty charts failed to mark it accurately). So on 27th July a party of three took the boat round past Valletta, Sliema, St. Paul's Bay, and Comino. We finally arrived in the shelter of Xlendi Creek well after dark — a full moon had made up for our lack of navigation lights — and anchoring the boat we slept on board. The next morning we started on the survey of the reef, using home-made buoys and a plane-table borrowed from the government survey office in Valletta. The frenzy of ferrying, fixing buoys, diving to check their depths, and then plotting them, kept us at work non-stop for ten hours that day, but when at last we finished at six o'clock we had on paper sufficient information to produce an accurate plan of the reef. In later days at Xlendi this was to form the basis for a series of vertical sections allowing us to construct a three dimensional diagram of the reef.

Our work at Marsaxlokk had now reached an impasse resulting from a violent current that swept across the only area remaining unexplored, and we decided that safety considerations made diving undesirable any longer. So we decided to spend the remaining four weeks of our expedition making a careful study of the wreck at Xlendi and raising part of it as the occasion arose. Luck now intervened for a second time in the form of a large villa in the north of the island, ideally suited as a base for our future work. Captain Gollcher, an archaeologist I had met in London the previous winter offered us the use of this villa for the rest of our stay; needless to say we accepted without delay, and had soon moved from our exposed camp site at Marsaxlokkk to the comfort of four walls (not to mention beds, and an excellent kitchen), at Mgarr. We moored our boat in Marfa harbour, the Malta end of the ferry route between Malta and Gozo, an hour and a half by sea from Xlendi, and forty minutes land-rover run from the villa.

We soon found the best timetable for our work each day, and were pleased to

find that it closely followed the proposals we had discussed in London the previous winter. The difficult compromise of achieving maximum output of work consistent with satisfactory quality in the results of each dive would, we had earlier concluded, probably require frequent rest periods for each diver. We had seen the results in other expeditions of trying to work a diver until he complained of being tired; the fall-off in the quality of each dive was only too plain. Working at Gozo we aimed at ensuring that no diver dived on more than three consecutive days and that he then had a fourth day in the villa.

The activity proceeds so: each day six divers take the full aqualungs in the land-rover to Marfa, load the boat, and set off again for Xlendi, arriving about ten-thirty. As soon as the boat arrives at the reef one of the crew jumps into the sea and using his mask looks through the clear water to the top of the reef, searching for the white stone that marks the edge of the reef opposite the wreck. He then calls out, guiding the boat to the ideal anchorage, and checks that the anchor has taken a firm hold on the reef. By now the first pair of divers have changed into their rubber diving suits (the sea is cold 200 ft. below the boat) and as soon as their 'lungs' have been checked, they jump into the water. Two others hand them the Nautilus, an electric tug and, hanging on to its handles the divers descend first to the top of the reef and then down its sheer sides. They speed down into the colourless depth without any effort, with "Nautilus" as their chariot, and halfway down the submarine cliff they are able to make out the ancient rockfall that marks the wreck. In holes and clefts under the giant boulders that crashed down the cliff maybe a thousand years ago lies the cargo of amphorae (the universal containers of the classical world), whose ship we were now regarding, a ship wrecked 2,200 years ago!

The two divers arrive at the bottom and switch off the tug; one unties the rope from the handle, and looks up to see that it hasn't snagged on the cliff as they trailed it out behind; despite the clarity of the water he can't quite follow the hundred-yard line up to the boat. Freed from the rope the other diver takes the tug off on a search along the foot of the reef, for there are many amphorae scattered, half-buried in the soft sand. He makes notes with his pencil on a formica board, until after four or five minutes he feels the first effects of nitrogen narcosis, Cousteau's "rapture of the deep." Knowing that his mind is no longer able to cope with detailed drawing or writing he turns on the Nautilus and makes his way back to the rockfall where his partner has tied the rope onto a perfect Greek amphora almost buried in the sand. Together they pull on the rope until with a sudden jerk the wine jar comes free, shooting a cloud of fine sand into the still water. The divers quickly swim out of this dangerous fog where an unseen kick might dislodge mask or breathing tubes, and start back up the cliff. Their ten minutes on the wreck is finished and they must now carry out a series of carefully timed decompression stops at pre-arranged depths (they each carry depth gauge and watch). These tedious waits just below the boat are essential if they are not to get the bends.

Just twenty-five minutes after leaving the boat they are being helped out of their heavy aqualungs and preparations are made to pull up the rope with its heavy load of amphorae. A medium sized jar filled with sand (as they all were) weighs nearly a hundredweight and pulling one up a two hundred foot cliff tends to be a lengthy business in the scorching heat of a Maltese day. (Malta is nearer the Equator than Tunis!) Having raised it to the surface it is carefully lowered into the rubber dinghy for safety during the other dives. Now is the time to take photographs in colour. The brilliant reds, blues and greens of the plant growth on the amphorae have but a

brief life spanning their release from the colourless depths which have been their home for twenty-two centuries, until just an hour later the harsh glare of the sun fades them to a dull brown.

The diving and raising of the amphorae takes about fifty minutes. By lunchtime this will have been repeated twice, and a collection of amphorae will be stacked in the rubber dinghy ready to be towed into Xlendi creek, and then rowed ashore for cleaning and handing over at the police station where, stored in the only cell, they would await collection by the museum authorities in Victoria (the Gozo capital). Now would follow lunch and after lunch the siesta. At four o'clock diving would be started again, with each pair of divers again descending in turn. This would finally end around six or seven o'clock when the anchor is raised and the boat heads back for Marfa, and supper.

Each day the collection of amphorae grew, and was added to until our departure. Each item raised was carefully sketched and measured, and on two occasions (when the sea was too rough for diving) a photographic trip was made to the Gozo museum to take record photos of the entire marine collection. By this time the volume of material raised from Xlendi reef had so outnumbered the previous exhibits that new rooms were being cleared for the display. Unless a new building is obtained for the collection only part will be on show at any one time. This would be most unfortunate, particularly since this case is of an early trading ship that was carrying wine jars from places as far apart as Turkey and Spain and with dates ranging over the 3rd., 2nd. and 1st centuries B.C.

The expedition is ended; its members have all returned to college with countless memories of eight weeks spent on a small island fifteen hundred miles south of London. It had achieved all it set out to do, and more. Plans are this moment being drawn up for a second expedition that will join even closer the archaeologist and the technologist. Over the winter many features of the new equipment tested in Malta will be redesigned for the 1962 expedition, and during these winter months too we shall be analysing and discussing the results of the 1961 project. The successful outcome of the expedition was largely the result of our good fortune — and perhaps the Gods? For Gozo is one of those places where time may be forgotten; its coastline today has no twentieth century veneer and recalls Odysseus' despair at finding the Phaeacian coast:

> * "Off shore, the pointed reefs set in a raging sea; behind, a smooth cliff raises sheer; deep water near in; never a spot where a man could on both feet stand and get to safety.
>
> If I try to land, I may be lifted by a roller and dashed against the solid rock — in which case I've had all my trouble for nothing. While if I swim farther down the coast on the chance of finding a natural harbour where the beaches take the wave aslant, it is only too likely that another squall will pounce on me and drive me out to join the deep-sea fish . . . "

We had a taste of such a storm, and for eight days never dared take the boat across the Comino Straits, for fear of ending as Odysseus had three thousand years before. This was surely the Great Earthshaker, Poseidon, growling in anger at our stealing his plunder? And as we dived through the wine-dark sea around Calypso's Isle were we, like Odysseus, protected from Poseidon by Athene.

* The Odyssey, Book five.

The Royal Air Force Expedition To The Karakoram 1961

by A. J. M. Smyth

THE question which is so often asked us, especially with the R.A.F. itself, is why the R.A.F. which can fly to vast heights, should worry about going to the Himalayas to climb to a mere 20,000 ft. or so; why, in these days of air survey, we should worry about taking theodolites to points of vantage to perform an archaic geographical survey; and why, in these days of helicopters and air drops, we should bother to walk hundreds of miles when other quicker methods of travel are available? The simple answer is that the R.A.F. Mountaineering Association is a climbing club like any other, and we enjoy climbing and all that it involves, especially in high mountains like the Himalayas. If we can serve some useful purpose, such as improving relations with the Pakistanis, in the process, then that is all to the good. Moreover air survey is far from perfect in high mountains where vertical differences of as much as 20,000 ft. can occur on the same print.

The reasons for our expedition were quite simple. In 1955 we had taken an expedition to the Indian Himalayas to climb in Lahul, and we felt the time had come to attempt to repeat our success, but this time in Pakistan, not through any lack of gratitude to our Indian hosts, but purely because we wished to widen the field of our activities. Since we wished to give numbers of climbers experience in high mountains we did not choose a single very high mountain to climb, but rather an area which was comparatively unknown, but which was able to absorb a number of enterprises simultaneously. We therefore chose the Hushe (pronounced Hooshay) valley of Baltistan. This straight valley has been visited by many expeditions on their way to Masherbrum which dominates it; but the Masherbrum Range contains a large number of peaks and glaciers which had not been looked at, nor was there any accurate survey of the 200 square miles of the valley.

After two full years of preparation, Mervyn Hughes and myself took off in a Bristol Britannia of R.A.F. Transport Command and duly arrived the next day in Karachi. We were the advance party, and it was well that we had come early. The main body of 10 other Britons accompanied by the bulk of the 5 tons of stores was to come a little later in an R.A.F. aircraft partially laden with a higher priority load. This meant that all would arrive at Karachi airport. All previous expeditions had sent their stores by sea and their entrance to Pakistan had been dealt with by maritime customs. We took nearly two weeks to convince the air customs that we were entitled to customs exemption, and that the Pakistan Ministry of External Affairs letter stating this, was not a forgery. Fortunately the way was clear for the main body who arrived just a week later. In spite of the delay, we feel we have contributed to the success of some future expedition, in removing a possible obstacle to their entrance.

We spent an interesting three days in Karachi, during which we watched and filmed the impressive Muharram festival when Moslems marched through the streets slashing themselves with knives until the roadway flowed with blood. Then we flew northward in Pakistan Air Force planes to Rawalpindi, but we stayed only two days before we took off again for Skardu. We were lucky in having a perfect day for the

Site of Camp I above the Aling glacier, (16,500 feet).

flight, and well we needed it. The aircraft had a ceiling of some 17,000 ft., yet we passed up the valley where peaks rise many thousands of feet higher. Nanga Parbat and Rakaposhi shimmered in blinding whiteness not ten miles from our wing tips, and we were able to get a special dispensation to film them.

The Indus forks just below Gilgit, and that branch which descends from the east embraces the Pakistan province of Baltistan in its basin. We landed without incident at the airfield of Skardu,[1] and were soon conveyed the 8 miles to the town.

Baltistan can well be described as a desert island. It is a desert because the average yearly rainfall over the valley is about 6 inches. Very little can grow unless it is irrigated by channels from the streams which flow down from the mountains on either side where the melting of the winter snows provide streams throughout the summer. It is an island because the natural entrance to Baltistan is from the Vale of Kashmir through its capital, Srinagar, all of which is in Indian hands; the routes are closed and all passage forbidden. The sole access is by the air route that we followed, and all passengers and freight must travel this way.

From Skardu our way lay for 62 miles along the Indus valley and then up the Skyok, where a fair jeep road had been opened a month before our arrival. Unfortunately we were unable to use jeeps on this road because very few had been flown in when we arrived, but we should have been able to use them on the return had we not made other arrangements. We were probably the last expedition to cover the journey from Skardu to Kharpalu using ponies for our stores. Our main preoccupation as we lay at the Rest House in Skardu was the hiring of sufficient ponies, and making the arrangements for High Altitude Porters who would be with us the whole time. Needless to say, extensive arrangements of kit were necessary especially as we decided that we were pressed for time, and it was important to make up the week that we had lost before leaving Karachi.

On 29th June, therefore, after only one night in Skardu, Sims, Nichols and Bottomer left with 3 High Altitude Porters and 4 ponies with the intention of going ahead as fast as possible, completing a reconnaissance of the South West Face of K6 and choosing a Base Camp site before the main body should catch up. We had now been joined by four Pakistani members — Squadron Leader Shah Khan, Flight Lieutenant Beg, Flight Lieutenant Afzal and Mr. Saib Shah of the Pakistan Survey. Together with these and supported by 51 ponies, we left Skardu on 30th June. During the four days it took to reach Kharpalu, many suffered from the great heat on the desert stretches, with the result that we soon adopted the habit of breaking camp long before sunrise to cover the bulk of the journey before the heat of the day. After 3 days a secondary party — Sahib Shah and Addis — ascended a mountain called Ombartro (17,201 ft.), the only official Trig Point easily within our reach.

At Kharpalu we paid off our ponies and engaged, instead, some 136 porters, all of whom were ferried across the massive and fast stream of the Shyok in 36 "Zacht" loads. A "Zacht" is a goat skin ferry poled and paddled over the muddy water in a rather haphazard manner. Most of us were glad when the cruise was over, for the water was little above freezing. Six miles farther on we entered the Hushe valley and rose but little to about 9,500 to Kande in 3 days.

1 When a cease-fire was arranged by the United Nations to end the fighting in the Kashmir war between India and Pakistan, Baltistan east of Skardu was declared a demilitarised area, and for this reason, entry can only be allowed by special permit and under special censorship regulations. Expeditions are therefore limited, and their photographic material is severely scrutinised on return.

At Kande big decisions had to be taken. Wilkinson and I left with all speed for the Ngamah to hear the results of Sims' reconnaissance. We found them in impressive surroundings. The base was in a superb alpine meadow encircled by vertical cliffs which rose for 13,000 ft. and offered little hope of climbing. K6 itself was depressing. Only one way was apparent, and that was very risky. A small terrace traversed the face opposite us, starting from the top of a difficult icefall and leading almost up to the western summit. But there were two great snags in this. Throughout its six or seven thousand feet of ascent it was menaced by overhanging glaciers, and from the western summit to the higher eastern summit the way looked difficult indeed. Were we to commit the expedition to spend a possible fruitless month here, much of it in danger, or were we to look elsewhere for kinder mountains? Sadly we turned away.

Before we abandoned K6 entirely we made a quick trip to the north side, although we knew that the Harvard expedition of 1957 had viewed this with disfavour, and had climbed much that was easy in the area. If the Ngamah approach was marginal, the north or South Chogolisa Glacier approach left no doubt whatsoever. It was frightful. In fact, when seen later in profile, it overhung for at least a thousand feet. The only possibility was a route onto a ridge which led to the next mountain. Thence the way looked arduous and long. Leaving the Chogolisa basin in the hands of our surveyors we made our way towards the undiscovered Aling.

The Aling Glacier, about twenty miles to the west, covers some hundred square miles and divides into innumerable smaller ice flows of which about eight are sizeable. Old skikaris (hunters) have occasionally ascended the main icefall, but the only visit of a person likely to record his impressions — as far as we know — was that of the U.S. Consul in Peshawar who spent two days above it in 1959 or 60. We could therefore regard the area as virgin. To get a general impression, Sims ascended Green Mountain, a 17,000 ft. peak occupying an island site above the main icefall. He did this on the day that the main body set up base camp at the foot of 13,000 ft. (July 14th). From there he was able to plan a site for a Camp 1 and to plan a route up a peak we called Aling I of about 21,000 ft. to the south. The next two days were occupied in establishing this camp at 16,500 ft., whence Sims and party started the ascent of the next ice-fall which proved of considerable instability and difficulty. It was only safe until 8 o'clock in the morning, the main snow line was 17,000 ft., and the temperature in the next 1,500 ft. so warm that on the second day most steps laboriously cut, had vanished. To increase their difficulties four days of bad weather broke, casting severe doubts on the route as a whole.

Meanwhile another party under Ridley pushed an arduous twelve miles up the moraines of the main Aling Glacier and established Camp Ia which became our main advance Base Camp at about 16,000 ft. Without waiting for the outcome of the Aling I attempt, Ridley and I with 3 other climbers and 5 H.A.P.s set up Camp IIa on the East Aling Glacier at 18,000 ft., sending down the porters and settling down to enjoy the brief spell of fine weather. At 4 a.m. on the 23rd, Jonson (our Naval guest) and I left camp in fine but dark weather to attempt a mountain we called Sceptre from the west. The snow was good for crampons, but far softer than it should have been at 19,000 ft. Nevertheless we gained height rapidly up steepening slopes until we were about half-way up on 45 degrees snow. It was still quite unnecessary to cut steps, but the ice axes encountered ice about a foot below the surface where the still unconsolidated new fall lay upon the old ice; safe enough before dawn, how about a descent at noon? There was still time to try the other ridge. We rushed down in the growing light onto the glacier, and up the gentle slopes onto the col between

Sceptre and Mitre. From there a rock and snow ridge rose at an angle of about 40 degrees to Sceptre summit. The thousand feet to the top was a race against the rising sun and softening snow, yet we found it profitable to climb one at a time, partly for added security, and partly because the height demanded plenty of rest. Three times we were forced off the ridge by cornices and forced out onto the steep face, but on the last occasion a pleasant rock chimney of about V.D. standard led to the summit where we arrived at 9.30. Without a single minute on top we turned and rushed down, never relaxing until we had crossed the last traverse and stood secure upon the ridge.

The next day Doc Jones and I led the way up Mitre (not to be confused with Baltoro Mitre) up a long gulley which led to the eastern ridge and the summit. Not far behind came Ridley, Shah Khan and Jonson. Compared with Sceptre it was an easy climb, but for me it was notable for the views it gave of Sceptre. The height was about the same but added acclimatisation allowed us to race up and down nearly 2,000 ft. in three hours, the snow being noticeably better than on the day before. But duty called and I finished the day with a sixteen mile walk to Base Camp.

The weather now settled down into three or four day cycles of bad and good. While Nicols and Jonson had a look at Double Peak, getting up to 18,000 ft. Sims, Wilkinson and Bottomer set up Camp IIb on the North East glacier at 18,000 ft. and reached to within 300 ft. of the top of Portcullis, only to be stopped by unclimbable ice. From IIb they set up IIIb at 20,000 ft., intending to climb Hunchback and Portcullis, both of them about 21,500 ft., from the north in one day, but the weather decreed otherwise, and only Hunchback could be reached — and that in white-out conditions.

It was now August, and we had set the 9th as the date for the evacuation of Base Camp. The Survey Party had finished their work on the Chogolisa, Chundogero and Masherbrum glaciers and were with us. Addis, mad for climbing, now joined Ridley, Nichols and Jonson for a last attempt up the North West Aling. With camps at 18,000 ft. and 20,000 ft. they climbed Etwa (Sunday) Peak (21,000 ft.) in parties of two on two successive days, reaching Base Camp with only a few hours to spare. The journey back, celebrated with two country dance festivals in the valley, a polo match with the Rajah of Kharpalu, and a night riding turtles in Karachi, ended yet another delightful trip to the Himalayas.

A SURVEY IN NORTH-EASTERN NIGERIA

By C. R. Cratchley

To most people, I think, the name Nigeria suggests a hot humid land of tropical forest and mangoe swamp; but this description is only true of the coastal belt in the south. As one travels inland, the swamp and high forest soon give way to savanna and orchard bush, which in turn gradually becomes more sparse, until one reaches a semi-arid belt of sandy plains with occasional stunted trees and thorn scrub, and perhaps the odd group of gnarled baobab trees. Northward again, beyond the borders of Nigeria, this semi-arid belt gradually merges into the Sahara. In the north-east of the country, the plains stretch monotonously for some two hundred miles, from the edge of the Jos Plateau down to Lake Chad. Round the edges of the lake, the sand gives way to cottonsoil areas which are flooded in the wet season, but which dry out to form a hard cracked surface, in the dry season. Villages are very scattered because of the scarcity of groundwater and the poor quality of the soil. On the south side of the lake where the cottonsoil extends over fifty miles from the lake, villages sit on small sand mounds like islands in a sea of clay. West of the lake small sand dunes break the monotony a little, but the ground is scorched and dry. It was quite common for the people to walk ten miles to draw water for the day. The migrant herds of cattle, which demand large quantities of water, add to the difficulties of finding adequate water supplies for the rural communities. Fortunately the situation has been improved in the last few years by the discovery and development of artesian water supplies, which are tapped at a depth of about 1,000 feet. To the local people the sight of water flowing out of previously dry ground, must be a miracle, and the opening of a new borehole seldom fails to draw a great crowd from miles around.

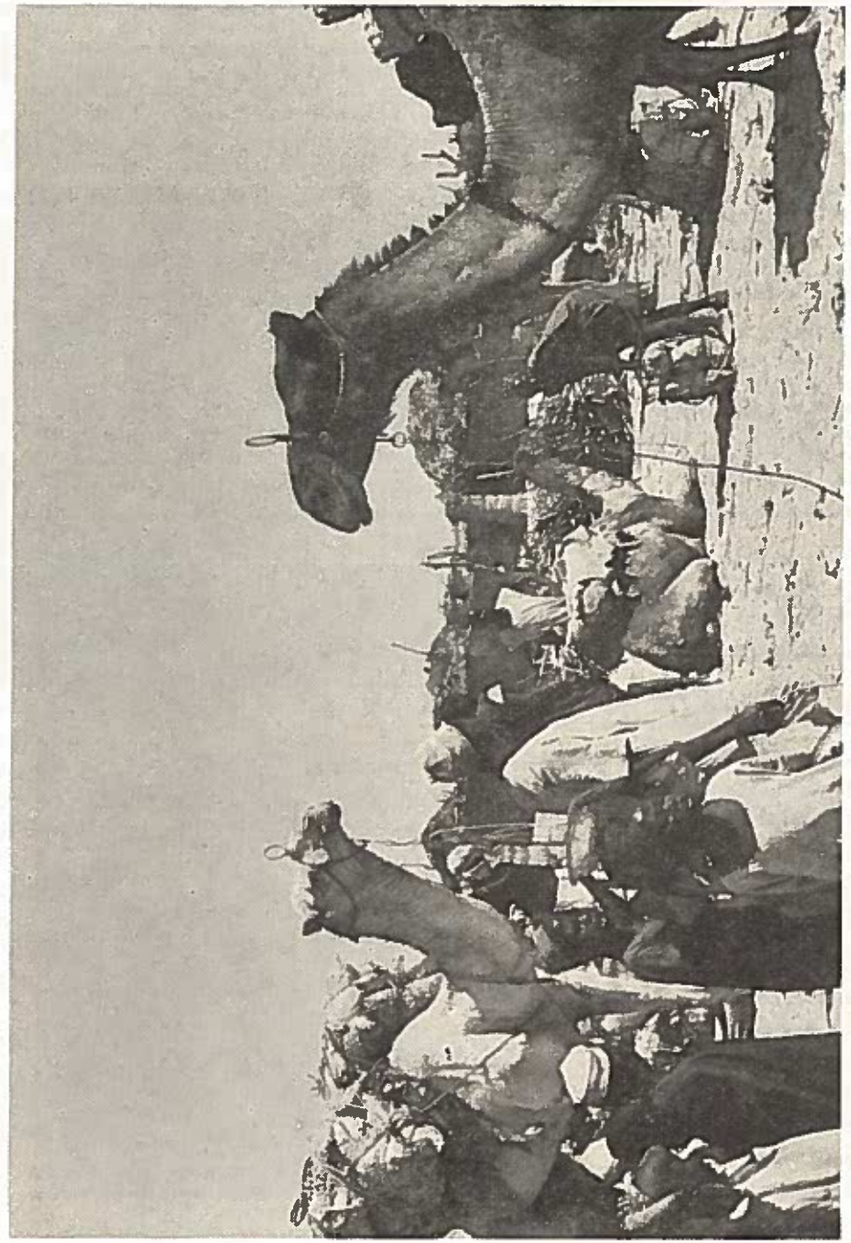
The geological Survey of Nigeria which I had joined after leaving Imperial College in 1957, was responsible for the planning of the borehole sinking programme. The boreholes yielded much useful information about the top 1,000 feet or so of the sendimentary succession, but information about the "buried topography" of the crystalline rocks which underline the sedimentary ones was totally lacking. A geophysical survey was launched at the beginning of 1959, to attempt to find the form and depth of the buried rock surface which could influence any future drilling programme. Seismic refraction and gravity measurements were carried out by the Overseas Geological Survey in conjunction with the Survey of Nigeria, during the first half of 1959. The former body provided the instruments, while the latter provided vehicles and covered the expenses of the Survey.

Unfortunately, no topographical map was available at the start of the work. The existing 1:500,000 map was little better than a sketch map for much of the area we wished to cover. A map was made from aerial photograph mosaics, partially controlled by astrofixes, and used as the base for all subsequent plotting of the results.

Before the survey started, we had the opportunity to see from the air, the country we should be working in. We took off from Maidugari, the provincial town soon after dawn in a Piper Apache, and, flying at about 100 feet above the ground, followed a track running roughly north-east to the western shore of Lake Chad. Horses reared and bolted with their riders, cattle ran distractedly round in circles, and people

in villages gaped as we flew close over their heads. Over Kukawa, which is about ten miles from the lake shore and half way up the western side, the plane swung east and flew over Baga, a fishing village on the tip of a small peninsular which extends about ten miles into the lake. Consternation ensued among the fishermen who were poling their papyrus reed boats just off shore — and many dived overboard to escape from the plane now flying low over the water. The papyrus boats are made from the reeds which fringe the shore, and are poled across the lake to the eastern shore in French Tchad Territory, (now the Tchad Republic), carrying goods for trading. The fifty-mile journey takes eight days and must be extremely uncomfortable as the boats are not as wide as a normal English rowing boat. The plane continued northward over the swamps and banks of papyrus which skirt the water's edge. We had hoped to see the Chad elephants which are unique, in that they spend most of their lives almost completely submerged among the papyrus reeds, just off shore. Attempts have been made to bring one into captivity, but none has survived the journey to Maiduguri. Countless numbers of ducks and geese continuously flew over the lake, occasional settlements of fishermen could be seen on the lake shore. Sixty miles north of Baga we turned west, following the fertile valley down which the River Yobe meanders in huge loops and contorsions, before it reaches Lake Chad. To the north and south of this lush green belt, the plain looks terribly dry and bare by comparison. At Damask, about fifty miles from the lake, we turned south, heading back to Maiduguri. It was now much hotter, and the sun was high in the sky. Very few people moved among the sand dunes. Far away to the south, occasional bush fires in the more forested areas sent columns of smoke up into the hot dry air. As the smoke rose it dispersed and blended into the general heat haze which hovered over the plain. We reached Maiduguri towards mid-day.

A few weeks later, the stage of the journey as far as Baga on the Chad peninsula was repeated by Land Rover. Carrying altimeters (one in each of two Land Rovers), we "levelled" the track from Maiduguri to Kukawa and out to the water's edge at Baga. This time the journey to Baga took two days as there were still large pools of water lying across the track at a number of places. These had to be avoided by detours through thorn scrub and along small footpaths from village to village, until we rejoined the main route. The first night we stayed in Kukawa, which was a great city a little over a century ago, and capital of the Kanuri Empire. At one time this Empire stretched almost continuously from the Niger to the Nile, and its capital was El Kanem, to the east of Lake Chad. As the power of the rulers declined, and the territory diminished, the capital moved to Kukawa. Today, Kukawa is a small, quite picturesque village; all that remains of the old city is a low, broken mud wall overgrown with thorn trees which have sprung up profusely all over the old site. That evening one of the itinerant bands which travel on horseback from village to village, played in the sandy square in front of the chief's house. Local women of the Knembu tribe "danced". Wearing long flowing dresses they walked, with stately and upright carriage, round and round in a circle, and then, on a change in tempo of their music, all would stop, and, standing on one spot, wiggle their bottoms up and down at a furious rate. One or two were obviously star performers and drew thunderous applause from the audience. When the chief was pleased with part of the performance, he gave the piper a pound note; the piper held it aloft for all to see, and after leaping excitedly into the air, piped furiously, telling how the chief had given the money for their fine performance. After this interlude, the dance went on as before. The party broke up about midnight.



Camels at Baga, near Lake Chad.

The next day we reached Baga, and had a short trip out in one of the papyrus boats. They are poled rather than paddled, and it appears that they can be poled most of the way across the lake, which seldom exceeds ten feet in depth.

After two more altimeter levelling traverses, the seismic equipment and gravimeter and two geophysicists from London arrived, and the main part of the survey began. Gravity readings were taken at about four-mile intervals along motorable tracks; each point was also levelled by altimeter. Seismic measurements were made at interesting parts of the gravity field to give some depth control to any later interpretation of the gravity data. At seismic shot-points, charges of up to 1,500 pounds of gelignite were used. One large explosion left a huge pit like a landmine crater just outside a village. The local chief was extremely pleased with this, as he said it would hold a lot of water for the village. Perhaps he thought we let off the explosion for that purpose.

Mishaps to vehicles were fairly frequent; trackroads were broken or bent all too easily; and on one occasion the hydraulic tubes on our explosives lorry were severed by a tarpaulin which got caught in the propeller shaft, and the vehicle could only be stopped by the hand-brake. In spite of these and other mishaps, we managed to complete the survey satisfactorily. The results showed that the topography of the crystalline rock is complex; and that its depth varied from about 10,000 to about 2,000 feet.

IMPERIAL COLLEGE EXPLORATION SOCIETY

ANNUAL DINNER

THE Society will hold its annual dinner on Thursday, March 8th in the Imperial College Union Building. Tickets, price 25/-, may be obtained from the Secretary.

EXPLORATION REVIEW

Exploration Review, the Journal of the Imperial College Exploration Society, is published in February each year. Institutions, societies and libraries may receive the Journal for an annual subscription of two shillings, including postage. There are a few copies of the 1st and 2nd editions still available, at the annual rate.

As an alternative, the Society would like to offer the Review in exchange for the publications of institutions and societies in order to develop its relations with other bodies with similar interests.

All correspondence should be sent c/o The Secretary, Exploration Society, Imperial College Union, Prince Consort Road, LONDON, S.W.7.