Exploration REVIEW

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IMPERIAL COLLEGE

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EXPLORATION REVIEW

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JOURNAL OF THE IMPERIAL COLLEGE EXPLORATION SOCIETY

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IMPERIAL COLLEGE EXPEDITIONS

Up to the present time, the following expeditions have beensupported by the College:-

1938 Jan Mayen Island Expedition—Greenland Sea.

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

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

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

1959 Apolobamba 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.

1962 Hornsund Expedition — Spitzbergen.
Sicily Expedition — underwater.
Southern Ethiopia Expedition.
Nigeria Expedition.

FOREWORD

EXPLORATION YESTERDAY AND TODAY

By Sir Raymond Priestley

AT the age of seventy-six I write as a 'has been'; perhaps, more correctly I should write as one of the 'might have beens', to wish the Society well.

In October 1908, I, and seven other "devils", left Liverpool in the White Star liner 'Runic' — £19 passage from Liverpool to Sydney (eight in one cabin, it is true, for Shackleton, as ever, was hard up)—on our way to join the 'Nimrod' at Lyttelton, New Zealand. It was the beginning of the most successful poleseeking expedition any leader of any country ever led. Professor Edgeworth David, at the age of 50, trudged with Mackay and Mawson, on their flat feet, 1,000 miles to the South Magnetic Pole and back, making it with one biscuit in hand. Ernest Shackleton made a leap forward of 360 miles and, upwards, of 10,000 feet, towards the geographical Pole and when compelled to turn back through shortage of food had all but pinpointed his objective. His successors knew exactly with what they would have to contend when their turn came.

Shackleton's character was well illustrated when, halfway through the winter, one of his four remaining ponies, when I was exercising him on a frozen lake, broke his headstall and cantered away up a steep slope that ended in a seaward-facing 100-foot cliff. Seeing a quarter of his animal transport heading for destruction he turned to me with a face like thunder. He saw that I still held the rope in my hand, that it was not my fault. He clapped me on the shoulder and said "Come along, Raymond, we'll catch the blighter yet", ran up the hill like a two-year-old and caught the pony at the brink of the precipice. That was an exercise of 'Brinkmanship' of the true Shackleton type.

Scott I did not know so well. I joined his last Expedition very late as a replacement for a casualty and within two months I said 'Goodbye' to him and his comrades of the Southern Party and never saw them again. But I have always agreed with the assessment of a comrade who said of the three great contemporary Antarctic leaders: "For swift and efficient travel give me Amundsen; as a leader of a scientific expedition I'll have Scott; but, if everything goes wrong and you are in a Hell of a Mess, get down on your knees and pray for Shackleton".

On the Nimrod Expedition we took South the first motor car. I had my first motor ride at 78 deg. sitting on a piece of angle-iron, over rough sea ice. We did ten miles down McMurdo Sound at over 30 miles an hour over windswept ice and then stuck fast in the first snowdrift we met. In January 1959, while I was being taken in an American helicopter from Scott's headquarters at Cape Evans to Shackleton's at Cape Royds, the pilot was told "Last time Sir Raymond was here he had his first motor ride". He grinned, took us down and taxied over sea ice for half a mile, bumping 20 feet up in the air every now and then.

In 1957 I visited West Antarctica with Prince Philip in R.Y. 'Britannia', the shortest ever Antarctic Expedition to date. We visited seven British Bases in three days. On the American Expedition 'Deep Freeze IV' in 1959, during a month on an icebreaker and a dozen hours' helicopter flying I saw more of the Antarctic coastline in two months than I had between 1908 and 1913 in 3 years.

As I watched radio-sonde balloons hovering 60,000 feet immediately overhead, I realised how much we had, in the old days, been the prisoners of our limitations. Our under-engined ships could only penetrate where blizzards had dissipated the sea ice and we therefore thought the Antarctic was one whirling storm. Today man can go almost anywhere on earth and can plumb the sea and air as well — and Space too. But the pull of the unknown, and of the comparatively little known, persists and the need to know more about every factor of the human environment is more urgent than ever if we are to survive. It is good that the urge to explore should not die out.

Societies such as yours help to ensure that it will not.

Raymond Priestley

EDITORIAL

As we enter into the customary bustle of preparation for yet another season's activities in the field, this is a suitable moment at which to pause and reflect upon the results and achievements of our most recent forays into the unknown; for that is the main purpose of this annual review.

With the inclusion of guest contributions, we aim to cater for all tastes. We hope that these articles will stimulate increased interest in scientific exploration not only here at Imperial College but also amongst other Colleges and Universities. Those articles on special topics associated with exploration may perhaps provoke valuable discussion; for it is only through the interchange of ideas that man progresses.

A journal such as this is just one medium (but a very important one) for establishing more communication and better understanding between University explorers, which up to now has been sadly lacking. With this in mind, our newly formed contact with Cambridge (of which this year's article by Charles Morris is one result) is a good start. However this example needs to be quickly followed up. We have a great deal to learn from each other but mutual co-operation is required — and in the form of action rather than words. The explorers must meet one another and frequently, if anything is to be achieved. A symposium on University Exploration would undoubtedly strengthen our relations but the will must first exist before it could become a reality. It is to be hoped that one result of all these efforts will be to raise the standard of the expeditions still further.

That this year's "Review" coincides with an exhibition on the activities of I.C.'s expeditions over the last three years is no coincidence. But an exhibition can go one step further than a journal. It gives everyone the chance to meet us in the flesh and to see for themselves just what we are attempting and with what success.

To many readers, the expedition narratives may seem to be lacking in scientific content. This is because few of the results are ever fully computed at the time of writing. The reader is reminded however that the scientific results and full accounts of all Imperial College expeditions are eventually published in the form of Final Reports. Copies of these are deposited in the library of the Royal Geographical Society and also in the Imperial College Haldane Library. Even so, the significance of the results is not always immediately apparent. Often a whole series of expeditions must be mounted before anything really worth while emerges.

Looking back on our 1961 expeditions, however, there are two events well worth recalling. First, the presentation to the College of a 3rd Century B.C. amphora and second, a paper on the glaciological work in Jan Mayen providing Great Britain's sole entry to a world glaciological conference held in Austria. Incidents such as these seldom get recorded but they serve to illustrate the results of our activities.

Soon we will be back in the field again, scattered around the world. It only remains for me to wish the 1963 expeditions every success.

MENTALITY, MORALE AND EXPLORATION

By Colonel Harry Pozner, M.C.

FACED with moments of crisis the human animal is capable of drawing upon unsuspected reserves of physical and moral strength. This fact is repeatedly demonstrated in the flow of events around us. It is extremely difficult to discriminate between the highest qualities of character and resistance to adversity shown either by the soldier who steadfastly fights a desperate rearguard action in a foreign jungle, or by the civilian who quietly organizes his affairs in the face of a rapidly progressive and incurable disease, or by the astronaut, tuned to the highest pitch of physical and mental preparedness, who allows himself to be projected violently into space. These are dramatic situations requiring heroic measures. Such acute intensity of adaptation may not normally be required from the explorer. Although technologically, the mechanics of an expedition make conditions much easier for him to tolerate than was previously the case, cumulatively, the total demands on his powers and resilience remain unchanged despite the shifting emphasis on different aspects of his activities.

No two individuals ever react in exactly the same ways to the same situational problems. The difference in their responses is implicit in their different basic personalities, the manner in which they function in their jobs, and in the nature of the complex relationships existing between them and the living world around them. These differences may take on a new and critical significance in circumstances where a self-contained, mutually dependent group of men is committed to a lengthy, demanding and potentially hazardous undertaking. In selecting personnel for an expedition it is currently fashionable to accept psychological screening as a useful means of predicting the compatibility of the individual and his contribution to group efficiency. It is in fact questionable whether a battery of psychological tests, however objective, is superior to the instinctive critical appraisal of a veteran leader with practical experience of management and an exact knowledge of his requirements. Unfortunately the main difficulty that seems to confront most expeditions is having at its disposal enough suitably and variously qualified volunteers on whom to exercise the powers of choice.

One valuable pointer to any selector is the motive which stimulates a man's application to join an expedition. There are a few generally acknowledged advantages for any group which chooses to isolate itself from conventional day-to-day activities. Under these conditions there are no financial demands or social complexities, community rivalries are largely eliminated, each man has the opportunity of devoting himself to his work in his own way, and all the individual efforts are systematically directed towards the successful attainment of the group objectives. Some men volunteer in order to carry out scientific research, to satisfy a stubborn curiosity, to pit themselves against the challenge of Nature, or simply to look for adventure. Others seem to want to prove something for their personal satisfaction, or establish themselves as recognizable identities. Not uncommonly they act from a sense of

revulsion against the compulsions of a hag-ridden society, or attempt to escape from the preoccupations of a materialistic rat-race. On a lower plane a few may be mainly interested in the personal kudos or the prestige of being associated with a well-publicized venture, since in these days there are benefits to be obtained from a world which gets its thrills vicariously from a television screen.

An assessment of a candidate's true motivation must be of importance to the leader who cannot jeopardize the success of his mission by taking with him men who are short-term enthusiasts, escapists, inconsiderate and egotistic, over-ready to find fault, uninformedly vociferous, or who are constitutional rebels and always interested in provoking an argument. There are certain inherent qualities of character and temperament which are not only desirable but almost essential if a person is to live harmoniously in close proximity to his colleagues for more than a short time. Emotional stability, unselfishness, thoughtfulness for others, physical and intellectual tolerance, determination, resilience of mind and body, and the ability to control successfully aggressive and hostile impulses are the ideal requirements. Common sense and a good average intelligence are undeniably necessary attributes. The really high-powered intellectual is only too often bedevilled by his mental short-cuts, his impatience, his frequent instability, and his relative ineffectiveness in making a definite choice of a practical course of action from among a variety of theoretical solutions to a current problem. All reports from recent expeditions agree that the optimum age group for their members is that spanning the ages of 25 to 40 years. One other point of interest is that the vicissitudes and inevitable compromises of married life appear to render the grass-widower less vulnerable than his bachelor associates to the psychological stresses of exploration.

Occasionally there is a renewed speculation as to whether different national and ethnic groups tend to develop in their pioneers abilities particularly suited to specific spheres of exploration. The answer obviously depends on early environmental conditioning, and culturally inherent talents to organize and master special techniques. The most that can be said is that in scrutinising any large gathering of experienced and would-be explorers one suspects, without any possibility of scientific validation, that they can be divided for psychological purposes broadly into two groups, classified (for want of a better name) as the vertical and horizontal temperament types. This arbitrary separation cuts transversely across national idiosyncrasies. The vertical temperament, exemplified by the mountaineer and detected also in the desert traveller and aqua-lung devotee, is characterized by introversion, sturdy individualism, self-sufficiency, and frequently a mystical and philosophical approach to the immediate enterprise. The horizontal temperament, more typical of men of the polar wastes and tropical jungles, can be recognized by its extrovert traits, a warmer gregariousness, and possibly a more practical, materialistic attitude in terms of objectives.

Extremes of climate, bodily discomfort, physical danger, sickness and injury are the natural occupational hazards of exploration. But there are more insidious adverse influences constituting a threat to an expedition's general well-being. Isolation, separation for too long from familiar faces and surroundings, emotional deprivation, ignorance of events, and apparent lack of progress are factors which can undermine confidence, obscure incentives, and induce a sense of frustration and apprehension of failure. One circumstance which is not fully appreciated is the effect on the total body-mind complex of disruptions of the normal diurnal life rhythms. This is best illustrated in the case of pilots of long-range jet aircraft. When they are racing against the sun they always seem to be touching down in a succession of dawns and to eat nothing but breakfasts during the 24 hours. The body, conditioned to a regular cycle of physiological processes, does not easily accept this sort of deviation, and expresses its failure to adjust rapidly in disturbances of function. Similar phenomena are observed durng the long winter polar months when the continual hours of darkness are divided by the clock into working "days" and sleeping "nights", which the body rejects with insomnia and digestive upsets.

Even the most hardened of explorers are not devoid of human weaknesses, and so it is not surprising that men under their leadership, when subjected to delays, unanticipated setbacks, and disappointments, may become irritable, querulously over-tired, disgruntled, anti-social and occasionally deeply depressed for some apparently trifling reason. During these times it is possible for personality clashes to develop, get out of control, and damage the integrity of the group. In a healthy mature group of men mild disturbances of mood are common, temporary and have no morbid significance. However, there is always a limit, varying with each person, to the capability for successful readjustment under continued stress. When this is reached a true psychological disorder can manifest itself in one of four ways; psychosomatic symptoms, emotional unbalance, deteriorating intellectual efficiency, inability to maintain good social relationships. One of the major implications of psychosomatic illness is an unconscious flight into some physical disability as a result of failing to cope on a conscious intellectual plane with a stressful situation. In these circumstances the body manifestations are influenced by the subject's level of intelligence and his powers of emotional self-control. In a small confined community the sensible, socially-aware man soon realizes the foolishness of giving way to uninhibited physical displays of resentment, disappointment or hostility. If he is intelligent without much imagination, over-conscientious, rigid in outlook and inclined to drive himself he may soon develop severe tension headaches. The same combination of factors associated with a change in normal habits can produce chronic indigestion, "rheumatic" types of pain in the neck, trunk or limbs, tiredness and apathy, or a vague feeling of generalized body discomfort and of being "under the weather". On polar expeditions the commonest recorded complaint is insomnia. This has been referred to by various names, of which the American term "Big Eye" is the most expressive, although the "500 Hour Eye" is also used to describe a particular phase in the life of the reluctant insomniac. Neurotic anxiety with an unreasonable degree of agitation and apprehension, sometimes expressed in impulsive emotional outbursts and aggressive actions, is not infrequently seen in the less stable people. Selection on the grounds of age and general fitness reduces the possibilities of acute mental disturbances severe enough to be regarded as a form of insanity. On very rare occasions a man may fall victim to an attack of overwhelming depression cutting him off from his friends by an impenetrable barrier of misery and despair. This type of illness tends to occur more in young men in their early twenties during the first weeks of real isolation. Disorders of intellectual functions show themselves in a frustrating absentmindedness or a poor memory for recent events. There is often an unusual slowness in thinking and an unwillingness to tackle any new project involving the exercise of imagination. Concentration can be affected, and it seems that in some instances where men tend to be overawed by their insignificance relative to space and time they defensively narrow their conscious fields of interests and attention and devote all their energies to some small, highly specialized task of limited general value and interest.

Failures of social adjustment are directly relevant to the problems of general morale,

and the cohesion of any group can be threatened by the man who becomes progressively intolerant of his colleagues. Some men develop an acute and self-torturing over-sensitivity to noise. Others begin to fret at the normally accepted disciplines, and a few obtain a perverse gratification from instigating arguments and arousing dissension. It is not unknown for some person to develop a complex system of resentment, almost delusional in quality, and retreat from the rest of the group, uncommunicative, watchful and suspicious, a victim of that condition so aptly described as the "Long Eye". The conditions of unusual propinquity give rise to some slightly bizarre inter-relationships but interestingly enough it has been observed that the emergence of any overt homosexual traits has been a rare and negligible occurrence.

Group morale is that intangible, ever-changing quality which permeates the atmosphere of an expedition. At its highest it induces every participant to give cheerfully and ungrudgingly of his best, subordinate himself entirely to the purposes of the common good, and maintain intact under trial his loyalties to his leader, his comrades and the furtherance of their mutual aims. The mainspring of morale is the leader, whose image has the virtues of coolness, level-headedness, emotional maturity and a strong, impressive personality. It is his responsibility to mould the selected applicants into a closely-knit team fully prepared in every way to tackle with confidence the tasks ahead of them. Independent of the leader there is a standard variation in group morale seen most obviously in systematic Antarctic surveys. On arrival at the Base the new group is subdued and uncertain in the presence of the veterans. When the relief has been completely effected morale shoots up and remains high until the onset of the enervating winter months. Spring and the prospects of physical freedom with purposeful activity cause morale to rise again until it reaches its peak just before the appearance of the next party. Despite much intrigued speculation physical sexual deprivation never seems to present much of a problem. Emotional needs in relation to sex appear to be more concerned with the desire to talk and confide in an idealised, feminine, comradely mother-figure.

The individual's morale is based on self-respect and the ability to fit successfully into a highly organised community. He is accorded a status directly related to the competence with which he carries out his own specialized tasks and participates in the general domestic duties. A few truculent class-conscious men are always ready to assume without justification that they are being under-valued or patronized socially and intellectually, and they may deliberately provoke trouble. Another small group which has gained an unenviable reputation is formed from young, arrogant and newly-qualified science graduates who tend to regard themselves as in some way privileged, resenting any restrictions on their activities or criticism of their uninformed opinions. A rational discipline, essential to good morale, must be enforced firmly and unequivocally by the leader, who should generously acknowledge merit and also recognize the rights of an individual to some privacy. Men living together nearly always separate out into small cliques based on a similarity of occupational, social and cultural interests, and even on shared resentments. If the leader is to remain a figure of impartial authority he must not allow himself to become identified with any particular sub-group. At times a leader's unpopular and autocratic decisions have resulted in a stiffening of general morale when his followers have submerged their individual differences in a united front of disapproval. One other subtle aid to morale is the emergence in any group of the self-constituted butt. This equable, cheerful clown enjoys a privileged position, induces a superficial sense of superiority in his companions, and offers them the chance of expressing their complaints in a less rancorous and more socially acceptable form.

A psychologist with an expedition is usually treated with circumspection. Perhaps there is some basic justification for this pragmatic attitude, since the life of an expedition revolves around the leader, and the qualities of leadership defy complete and accurate analysis. Dramatic leaps into the darkness of ignorance are not usually made by cautious, sensible and sweetly-reasonable men. Most of the great pioneers of the past were distinguished, not by stability or disinterestedness, but by an all-compelling inner determination, courage, and obsessional drive. Judged on the conventional standards of normality they should never have made history, and yet their exploits have inspired the trail-blazers of today to break from the Earth and travel towards the stars.

EXPEDITIONS 1963

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

Beerenberg (Jan Mayen) — A party of 12 will continue and extend glaciological work started by the 1938 I.C. Expedition and developed by the 1959 and 1961 U.L. Beerenberg Expeditions. The programme also includes work of geological, archaeological and botanical interest.

Stauning Alps (E. Greenland) — Studies of the Berzaekerbrae and ascents of some of the unclimbed peaks in the area are the objectives of a party of 8 glaciologists and mountaineers.

Ibiza (Balearic Islands) — Underwater geological mapping and biological studies form the main interests of the party of eight, though some archaeological work may be undertaken. The party will co-operate with a Birmingham expedition which will have a programme complementary to that of the I.C. party.

Sierra Leone — Botanical and Zoological collecting in the northern inland region at the head of the Scarcies River will be undertaken by a party of eight. The area is not well known biologically and the collections will be of great interest.

Ceylon — Two I C. zoologists have joined up with four U.C. medical students to carry out a combined medical and entomological programme.

Southern Morocco — A party of six will travel in two Landrovers to Morocco to locate and survey a 15th century Spanish fort at the mouth of the Wadi Shebika, and to make botanical and zoological studies.

Malta — Three experienced underwater swimmers are joining up with others from the R.A.F. and the R.N. to study submerged evidence relating to sea level changes and archaeological problems.

FROM GIBRALTAR TO POSITANO

By John D. Woods

THE coastline in the region of Marseilles is typical of many areas of the Mediterranean. Mountains meet the sea in abrupt cliffs extending for hundreds of feet above and below sea-level; offshore, equally precipitous islands break through the surface to be surrounded by the sparkling foam of the turbulent waters. Passing among these islands in a small boat one sees great cliffs of limestone towering up like flying buttresses with deep caves and overhangs fashioned like sections of a great amphitheatre. Closer inspection reveals a continuous six-foot notch, cut four to five feet into the cliff by continual wave action, and enlarged at points of weakness to rounded caves.

All these features are found again under the sea and an aqualung provides the means to explore the caves and arches by swimming down the cliffs to a smooth sandy floor, two hundred feet or more below. Such magnificent scenery is not new to the lucky divers of the Mediterranean. They have brought back many photographs to convince us of the existence of these underwater caves and arches, canyons and fearful overhangs veneered with brightly coloured sponges and corals. Geographers have likened them to the features found above present sea-level formed between the periods of polar glaciation when the sea-level was higher than it is today. They suggested that an investigation of the underwater marks, particularly the notches and caves, might produce evidence of periods of lower sea level, corresponding to past periods of heavy polar glaciation. This investigation was attempted during the Easter and Summer vacations of 1962 by a small group of divers from Cambridge and London.

At Easter, John Schofield from I.C. had accompanied Nic Flemming from Cambridge, Dr. Waechter of the London Institute of Archaeology and Herb Greer, an American freelance photographer, to Gibraltar. There they found good signs of submerged sea levels despite the fierce currents existing between the Straits of Gibraltar. The results, when analysed on their return to England, seemed too good to be true; the ancient sea level marks found at each dive location occurred at the same series of depths. However these could have been produced by the bodily movement of the entire area (as we were later to find in the Bay of Naples); further results from a variety of locations around the Mediterranean became of vital importance. So during the summer, Flemming and I dived at a series of sites along the coasts of France and Italy, with one brief excursion into Spain, to continue the project.

Our first area, the Franco-Spanish border, had brought us to the Laboratoire Arago at Banyuls-sur-Mer, where, registered as "chercheurs étrangers", we were provided with accommodation, laboratory space, and those twin diving necessities, compressed air and a boat. This area, dominated by the Pyrenees, proved a difficult one for our project, but by early August Nic had a series of profiles that fitted well with the Gibraltar measurements, and so, fully satisfied, we moved to our next area, the Bay of Marseilles.

At Marseilles, our host, Prof. Pérès, director of the Marine Station d'Endoume, was able to offer facilities similar to those at Banyuls. Our relief at leaving the stormy weather of the Costa Brava, was soon jarred by the "force 8" Mistral blowing across the Bay, but after three days this subsided and we were able to start work among the islands, diving from the Research Vessel "Antedon". This converted twenty-metre fishing boat is a diver's dream, equipped with radar, v.h.f. ship-shore telephone, sonar, electric winches and compressor, and a near perfect diving ladder. Our diving performance improved immeasurably as a result of "Antedon" and her co-operative and experienced crew, and after a couple of days we were able to greatly extend our programme of work.

Many of the younger research workers attached to the marine station dive regularly to collect specimens and study marine fauna in situ, and we were able to draw extensively on their knowledge of the local diving sites. Thus, each day we would set out to explore caves or cliffs recommended by them, and more often than not they dived with us to point out interesting features. Flemming and I seldom dived together at Marseilles; by separating and working at different locations, each accompanied for safety reasons by a French diver (or by Charles Carmichael, who had joined us for the duration of his army leave), we doubled our work capacity. Our French companions soon came to accept our (to their eyes) unorthodox techniques, and we worked excellently together.

To avoid long decompression stops we always descended rapidly to the base of our chosen cliff, usually between 50 to 70 metres deep. On arrival we quickly finned out from the cliff to ensure that we were on the sea bed, and not an isolated ledge; then back to the cliff along the trail of sand stirred up by our fins on the way out, and up the cliff face. As we rose we examined and sketched the caves and notches, swimming up to 50 metres either side of our line of descent to check features for continuity. When we found a cave, the second diver was stationed at its mouth while the dive leader entered the hole, lamp in hand, to find its extent and search for clues of its formation.

The time on the cliff was limited to half an hour, at the end of which we carried out decompression stops at 10 and 5 metres, with duration depending on the maximum depth encountered. On regaining the boat, we examined the formica drawing-boards and, if necessary, a second pair of divers would make a rapid descent to check any doubtful feature or to explore further a large cave. The time spent at any one site seldom exceeded an hour, and up to four could be examined in one day.

Caves provided the most fascinating diving. Once inside them we could direct our torches at the walls lighting up beautifully coloured algae, sponges and red coral which branched down from the roof like antlers of some marine stag. The entrance would remain visible as a blue luminous patch in the background, but frequently another opening would appear as an exit. Moving carefully to avoid disturbing the soft deposit on the floor, we would enter and explore the side branches, which often ended after a few feet but occasionally led into further grottos and more corridors. One remarkable cave at La Tripery was entered at a depth of 15 metres through a vast archway which narrowed inside until suddenly, 50 metres from the entrance, great stalactites appeared to block the passage. Perhaps like three other caves which we explored, this cave also extended as a tunnel which passed through the headland to clear water beyond but unfortunately we were not able to find out.

Few of the caves were inhabited, but a notable exception was the labyrinth (miles

of winding passages and grottos) found in Le Veyron, a completely submerged reef eight miles off Marseilles. Here fish abound in plenty, each turn of the passage producing a pair of eyes glinting in the light of our torches. Luckily our lamp and the noise of our aqualung mechanisms would usually win the battle of nerves with these groupers, who would swim into their rocky clefts where we could not follow. However at each encounter I, at least, carefully judged the separation of those staring eyes before deciding whether to advance or retreat! Sometimes the diver would grip the cave wall to steady himself, only to have it slither away from under him; although the octopus is a fascinating creature to watch in sunlight, it can reduce a complacent diver to a bundle of nerves when encountered in the dark.

At several of our more exposed diving sites we came across the remains of classical wrecks, marked by their cargo of amphorae. "Massilia", founded circa 600 B.C., was the first Greek colony along the coast of modern France and maintains to this day its dominant trading position. The old Greek port in the centre of modern Marseilles now shelters fishing and pleasure craft in place of the great merchantmen of two thousand years ago. The magnitude of the Marseilles trade in classical times was shown by Cousteau when he excavated a 100-ton Roman wreck caught on a ledge 140 feet down the cliff of the Grand Congloué island. Despite the continuous work on this site over a period of eight years we still found a considerable mass of material on the ledge when we dived there this summer.

After our month in Marseilles which included a brief tour of the Côte d'Azur as far as the marine station at Villefranche, we moved our base to Naples. Here, occupying the Royal Society table at the Stazione Zoologica, we carried out two brief projects. Around the Bay of Naples a mass of Roman cities, ports and splendid villas have become submerged by the steady rise in sea level, and the catastrophic land movements associated with the Vesuvius group. We explored the artificial mole thrown across the military port of Imperial Rome at Misenum, and on the headland found a now submerged vivary cut out of natural rock which was used to store fresh fish for the port commander. At another site we dived on to the flooded verandah and basement of a Roman villa still standing three storeys high out of the sea. From the depths to which the various buildings are flooded we were able to estimate the net land and sea movements over the last thousand years.

This, however, was only a minor aspect of our programme which we continued on the island of Ischia, a volcanic island off the North headland of the Gulf of Naples. We lived in the village of Dr. Dohrn, director of the Stazione Zoologica, and each day the caretaker took us round the island in his small open boat so that we could dive on to the the lava flows. As at Marseilles we found ourselves descending vertical cliffs, but collecting samples of the tough volcanic rock of Ischia proved a major problem, involving heavy work which is dangerous at such depths. However, during our brief stay on this magnificent island we dived at every headland and reef, and inspected the one large cave.

On our last working day we took the coach south around the bay past Pompeii and Amalfi to Ravello. This small village, the summer resort of Mrs. Kennedy, proved to be on the coast as we had hoped, but located six hundred feet above the sea—hardly ideal for diving. So we returned to Positano where we snorkelled in the clear warm waters at the feet of those sharply dropping cliffs, with a host of caves at sea level; this was a fitting climax to two months diving in three countries and at a multitude of sites along a thousand miles of coastline.

HORN SUND 1962

By Robert C. Schroter

SVALBARD to many people suggests fearsome, cold, barren wastes and glaciers, feeding the sea from uninteresting snow-covered mountains; but to the nine members of the Imperial College Horn Sund Expedition the islands have wonderful memories of polar bears, whales, seals, foxes and immensely fascinating tundra with the beauty of its many flowers, lichens and mosses.

The venture was originally planned as a training expedition for the continuance of glaciology in the College. It soon became apparent, however, that the chosen region offered the opportunity of investigating a number of new lines of research hitherto untackled by University undergraduate parties.

The Islands of Svalbard are some 600 miles north of Norway and at the same latitude as the North of Greenland. Our objective, the Werenskiold Breen at latitude 77 deg., lies just to the north of Horn Sund in the south of Vest Spitzbergen. During the International Geophysical Year 1957-58 a Polish Glaciological and Meteorological Expedition, under the leadership of Professor A. Kosiba, carried out an extensive programme on the Werenskiold Breen. From their recently published preliminary report the area appeared ideally suited to our studies, both scientifically and from the points of convenience and safety.

The programme was divided into two main sections: General Glaciology and Botany as related to Glaciology. The first section was to be tackled by six members of the team, leaving the two botanists to work on the second. After discussing plans with Prof. A. Kosiba of the University of Wroclaw, he very kindly allowed one of his research staff, Mr. Baranowski, to join our expedition. Mr. Baranowski had already spent some four summers and the winter of the I.G.Y. in Horn Sund and knew the glacier on which we proposed to work very well. Thus by June 1962 our minds were becoming geared to thoughts of eight weeks of intensive field work in the High Arctic.

After devious routes we all met up at Harstad in Northern Norway. Unfortunately our departure was delayed for nearly a week, as the coal ship "Ingerfem" which was to take us to Longyearbyen in Vest Spitzbergen, had suddenly altered her sailing schedule. However, by July 10th we were on our way.

On the third morning out from Norway the ship ran into a very thick wall of fog, and, with the ship's engines quietly idling, the silence on deck was eerie. Suddenly, a small chunk of ice floated out of the gloom past the bows. Then another was sighted and in a moment an impenetrable barrier of pack ice confronted us. We were told that unless the wind changed direction and loosened the ice floes, the ship would not be able to get through to Longyearbyen, some 30 or 40 miles ahead. For the next

The Werenskioldbreen and the area to the north of Hornsund, West Spitsbergen.

AERIAL PHOTO BY COURTESY OF THE NORSK POLARINSTITUTT.

Nora, the ancient form of dance-drama performed at a village near Nakorn Sri Tamarat, South Thailand.

ROLLEIFLEX PHOTO BY BARRINGTON-BROWN

36 hours "Ingerfem" sailed patiently around outside the pack ice, with only the sight of a sealer, weaving between the floes, to break the monotony. Then on the horizon we spotted another small ship, feeling its way out from the fjord—it was the Governor of Svalbard in his ice ship "Nordsyssel" coming to collect us and to carry us south direct to Horn Sund. Transferring to this more suitable craft we were on our way again, but the voyage through the sea ice was most arduous, and for a long time it was uncertain whether the ship would manage to reach Horn Sund.

It had been intended to land our stores at a small trapper's hut at Hyttevika just north of the fjord, but the very tight packing of the ice made this impossible. Indeed we were very fortunate that Isbjörnhamna, some ten miles further south on the northern shore of the Sund, was ice free, and it was here that the expedition disembarked.

The Botanical team had planned to base themselves mainly at Isbjörnhamna and so our forced landing suited them. However, the glaciological party was presented with the task of transferring all its equipment north to Hyttevika, and thence on a further journey of two miles to the Werenskiold Breen. We hoped to make this last part by the jeep stationed at Isbjörnhamna and loaned to us by the Poles. Difficult terrain between Isbjörnhamna and Hyttevika made overland transportation impracticable. The only possibility was to ferry everything by sea using a small boat with an outboard motor, though such a journey would be very hazardous. Small chunks of ice, less than fist size, may be dangerous as they can break propeller blades or even bend the drive shaft. Before we could begin the transfer, another delay occurred; this time—wind. Within ten hours of our arrival in Horn Sund, a strong gale sprang up, raging for two days; it blew slightly off-shore, freeing the shore of most of the ice. After 3 days of frustrating inactivity the wind died down sufficiently for us to make the trip to Hyttevika without mishap. The seals who accompanied the boat all the way provided much amusement; nevertheless, the dangers of small boating in these waters were continually apparent.

During the bad weather simple meteorological stations were established at Isbjörnhamna and on the Ariebreen, a small glacier just north of the Polish station. At these subsidiary stations only simple measurements were to be made—precipitation, humidity and air temperature. On the Ariebreen a single ablation pole was placed at the snout. Ground and permafrost temperatures at depths of 20, 15, 10 and 5 cms. were also measured at Isbjörnhamna.

Eventually, on 20th July, the main base at the snout of the Werenskiold Breen was established, but ten days later than expected. A full meteorological station was set up to measure air and ground temperatures, absolute and relative humidity (all with continuous registration), air pressure, wind velocity and direction, with observations of cloud, visibility and any special phenomena. As Heat and Mass Balances were to be attempted on the glacier, total radiation, sunshine and water evaporation were also measured. For secondary interest the heat flux near the ground surface and the temperatures at a number of depths below the ground for various characteristic tundra surfaces were measured. A small subsidiary station at the glacier snout was used to record air temperature, humidity, wind and cloud.

To man the second main glaciological and meteorological station in the upper firn region required the sledging of some 600 lb. of equipment seven kilometres up the glacier. Sledging was a new experience for all of us, and for the first hour we eagerly charged up the hard snow slopes. Then three difficult miles of slush and melt streams on the flat surface lay ahead; a severe trial for such a heavily loaded Nansen sledge. Five hours later we reached the camp thoroughly exhausted and with any enthusiasm for man-hauling our sledge completely shattered. A station to measure the same meteorological elements every six hours as at Base was established and left under the charge of two men.

In the meantime, the botanists, Catcheside and Leaver, had begun the main part of their programme. This was an attempt to employ the new, but not proven technique of lichenometry to date past glacial movement. Normally, terminal moraines, due to different periods of glacial transgression, form concentric arcs; the relative ages of these mounds can usually be estimated by comparing the erosion of the composite rocks. The moraines of the Werenskiold Breen, however, run into one another and are composed of fluvio-glacial material. In consequence the erosion of the various parts of the moraine was very similar and dating impossible. Nevertheless under near-constant climatic conditions a certain species of lichen increases in diameter at a constant rate. Provided that a sample of this lichen (whose age can be determined) is at hand, it is possible to trace the history of the retreat of a glacier. In practice, however, two real difficulties are apparent. In some areas a dated surface is very difficult to find and one has to resort to such methods as radio-carbon dating of raised beach deposits; this is a very suspect procedure in regions subjected to violent storms. Secondly, "frost shattering" and "heave" can be a terrible nuisance. Indeed it was the second difficulty which prevented the application of Lichenometry to any of the glaciers in the region. The soft rocks break up so easily that it is impossible to find any areas of stable rock.

The possibility that we would not manage to perform the dating was foreseen before leaving College and an alternative programme, giving a quantative description of lichen succession across a terminal moraine, had been developed in outline. The change in lichen type and density was observed from the snout of the Ariebreen, over its terminal moraine and down to the tundra on the raised beach. On the tundra the association with typical vegetation, including all species of flowering plants, was established. This investigation, which is complementary to lichenometry, had not to our knowledge been conducted before and the results obtained will be most useful for any future botanical dating techniques employed by glaciologists.

An ornithological expedition from Oslo University, ringing geese in the Horn Sund area, kindly invited Catcheside and Leaver to join their trips around the coast. In this way they collected over 130 species of lichens and mosses and 32 species of flowering plants. The collection, now fully identified, has been given to the British Museum and constitutes the most comprehensive collection of Southern Spitzbergen.

Within a week of our arrival eleven ablation poles had been drilled into the ice at suitable points in the upper regions of the Werenskiold Breen and a transverse line of stakes had also been established about 200 metres upstream of the snout. This was to determine the snout velocity profile of the glacier's surface flow. Considering the very foggy conditions—one could rarely see further than 50 yards—it was a good achievement. Even so, Schroter and Pert managed to locate one ablation pole right in the middle of a small crevasse, a mistake that was not realised until the snow bridge it was standing on collapsed some three weeks later. The following week the visibility improved somewhat and the party established the remainder of the 27 ablation poles, a transverse flow line in the middle region of the glacier and a longitudinal flow line approximately along the fastest streamline of flow. The ablation stakes in the lower part of the glacier were measured daily (though some were measured more frequently)

and those at the higher altitudes (excluding those at the top camp) were read at three-day intervals.

The Summer of 1961 must have been unique on the Werenskiold Breen, for, instead of the normal 1 to 2 metres of ablation in the upper region, some 6 metres of snow had melted away. This considerably reduced the snow cover on the glacier ice and presented us with a chance to produce a contour map of the firm edge and snow coverage in the accumulation zone. Unfortunately the old enemy "Time" prevented the completion of the map, though the main parts were recorded.

In order to produce any mass balance of the Werenskiold Breen, the water run-off in the three rivers leaving the snout must be accounted for. Two of these rivers originate at the snout, being the collection of the local surface and subglacial streams. The third river is extremely spectacular, issuing from a hole in the ice, as a water spout, some 20 metres upstream of the snout. The water, dirty grey in colour due to the suspended rock flour, probably entered the glacier through the crevasses and holes some four kilometres up the glacier. It would have been interesting to have checked this, and also to have calculated the residence time by means of a tracer, but unfortunately we had no suitable dye with us. To measure the flow of each river, which we did once a week, Baranowski would stand chest-deep in the freezing water for anything up to two hours, measuring the water velocity at various points on the cross-sectional profile. The task was made even more unpleasant by the high speed at which the water flowed over the loose rocky bottom.

Swelled by the excessive melting of the glacier in 1961, the run-off rivers completely recarved the terrain in front of the snout, rendering obsolete a detailed map of the area produced by the Polish expedition and published only in 1959. The hydrological details were completely transformed; the snout had retreated further and we noticed a number of periglacial phenomena, such as permanent patches of lake-like ice, stripes and eskers, which had not been recorded. Mainly by Axtell's excellent efforts we remapped by Plane Table the whole of the area bounded by the snout and the circumscribing terminal moraine to a scale of 1:7,500. The large scale allowed practically all the fine hydrological and other information to be recorded.

It had been arranged that the Governor should pick up the expedition in his ship at Isbjörnhamna some time in the first week of September, leaving us seven full working weeks in the field. However, by chance, the Norwegian expedition intercepted on their small transistor radio a conversation between two whaling boats, in which it was stated that the Governor was going to Horn Sund on August 26th—a whole week early!

If only we had had a radio receiver/transmitter set with a 50-mile range, it would have been a tremendous advantage to be able to establish direct contact with the Governor, so that we could have had better warning of the intended early departure. Four days was very little time indeed to break down both glaciological camps and as yet the plane table map was unfinished! However, by the late afternoon of the 25th August, all our equipment was waiting on the beach at Hyttevika for the trip back to Isbjörnhamna. Once again gale force winds held us up; the wind was blowing straight off the sea, packing the ice tight against the shore and making it quite impossible to use a boat, even when the wind eased. "Nordsyssel" arrived in Horn Sund early in the morning of the 27th, but could not penetrate the ice. The equipment, together with Axtell, Husselbury, Mitchell, Pert and Smith, was still stranded at Hyttevika for almost 24 hours when, luckily, an off-shore breeze loosened the pack ice sufficiently for our boat to make the trip and take all our gear out to the ship.

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EXPEDITION RESERVE AND EMERGENCY RATIONS

By A. de Jong

THE selection of expedition food supplies depends on many factors but, in order to support life in the human body, three fundamentals are necessary. In order of importance these are air, water and food. The first is obvious, but the second is the key to the whole problem since the quantity of water available dictates completely the types of food which should be provided.

To maintain the nutritional status of the members of any expedition, provisioning must be based on a pre-planned ration scale. The composition of the scale depends on several factors including the size of the party, its load carrying capacity, the terrain and climate in which it will be operating, and the amount of physical exertion anticipated.

Sufficient Calories must be provided for Basal Metabolism and Energy Expenditure, the need varying according to the level of physical activity and climatic conditions. For sedentary work in temperate or hot climates the figure may be as low as 2,500 Calories, whereas it may exceed 5,000 Calories in cold climates. For most expeditions it is usual to aim at a figure of 4,000 Calories daily which is adequate unless exceptionally heavy work is contemplated.

Food should be provided in balanced quantities so that, of the total Calories, 11 to 14 per cent. are afforded by Protein, 25 to 35 per cent. by Fat, the balance being supplied by Carbohydrate. For cold weather work one should tend towards the upper limits stated, and for high altitudes and desert conditions the lower values should be used. It is important that the diet should also afford sufficient Mineral Salts and Vitamins, and if fresh foods are not available in the necessary quantities, supplements should be considered.

The diet should be sufficiently bulky to satisfy appetite, and must be digestible, varied, and capable of being attractively cooked and served. It must also be acceptable on racial and religious grounds. The rations should be reasonably economic and, when feasible, procured locally. Storage and portability problems sometimes require the provision of preserved foods and special ration packs, the latter being of particular use as reserve supplies.

The other essential in any ration scale is water. For most normal expeditions the daily per capita water requirement is of the order of 5 to 6 pints. At high altitude the body will lose large amounts of water by breathing and it is therefore necessary to increase the daily intake to a figure of from 8 to 10 pints daily. In extreme cases of very heavy work and excessively high temperatures, intakes of 25 pints a day have been recorded, but for most desert regions a useful guide is that the intake should consist of a basic allowance of 10 pints daily, supplemented by 1 pint for each hour of physical activity.

If the body is short of salt it cannot retain water, and it is advisable to take extra salt when the fluid intake exceeds 10 pints daily, in order to replace losses of salt in the sweat. This can be conveniently done by dissolving one 10 grain tablet in each

pint of water, giving a 0.1% solution. In order to avoid gastro-intestinal upsets the extra salt should not be taken in the solid form.

If water consumption is in excess of requirements, the kidneys normally exercise an automatic control and the body-water balance is maintained by passing the unwanted water through the kidneys in the urine. If, however, consumption is below requirements there will be a loss of water from the body tissues, and, if continued, this will lead to dehydration. Immediate symptoms of this are not readily apparent, and it should be noted that lack of the sensation of thirst is not necessarily evidence of the lack of dehydration. When the body is short of water, the kidneys conserve it by concentrating the urine to the maximum extent to which they are capable. Consequently, the volume of urine that continues to be formed is determined by the total quantity of soluble material being excreted. Hence, during water shortage, foods with a minimum of soluble material for removal are preferable, and the protein intake should be minimised.

For a normal man in temperate surroundings, water losses from breathing and from the skin without excessive sweating due to hard work, are about 1½ pints, water passed as urine about 1 pint, in faeces about ¼ pint, giving a total loss of about 2¾ pints. Allowing ½ pint provided by combustion of food, this gives a final requirement from external sources of at least 1¾ pints per day. This may be further reduced to about 1½ pints, during water deprivation, due to water in the body becoming available. If this amount is not provided, a severe water deficit will result and will finally prove fatal.

It will thus be seen that in an extreme emergency the minimal water requirement is 1 to 2 pints daily under favourable conditions and may be increased considerably unless care is taken to minimise excessive loss by sweating and other sources. Under these conditions of water scarcity the only food which will provide the necessary requirements is carbohydrate. Protein must be reduced to under 7 per cent. of the Calories and only small amounts of fat can be tolerated, except under arctic conditions where it may be increased somewhat, provided sugar is also available. If 100 grammes of sugar are taken, the daily minimal water requirement may be reduced to 1 pint. It must be stressed that this is an absolute *emergency* level of diet, making no provision for energy expenditure, and cannot be maintained for a period much in excess of 10 days.

If water can be obtained in quantities in excess of 3 pints daily, the prospects for the survivor are much more promising, and energy expenditure is then dependent on his being able to obtain sufficient balanced foods for this purpose. Most of the energy will be derived quickly from carbohydrate although, by virtue of weight considerations, fat will also play an important part in his diet. For short periods protein is not of such great importance, although it is desirable to provide sufficient to avoid a call on the reserves of body protein. Generally protein is always kept fairly low in Emergency Rations, as distinct from Reserve Rations, since in most cases there may always be doubts as to the free availability of water.

On the other hand Reserve Rations, which may have to be used for normal or heavy work expenditure, should consist of a balanced diet, but be packed in such a way that they will have as long a shelf life as possible, be compact for easy stowage, and as light as possible. These requirements usually demand the use of dehydrated foods, and in compressed form. By careful design and selection a moderately palatable and varied diet can still be achieved, but of course some sacrifice of the more exotic menus may have to be accepted. Nowadays, the development of new packaging techniques and new methods of food preservation, permit great savings in weight and bulk to be made. The tin-opener of a few years ago has almost given way to a strong set of teeth or, at worst, a razor blade for opening the modern flexible package except, perhaps, at base camp where lightness of supplies may not be so important and the well fed explorer yearns for tinned food and variety.

In Table 1, three ration scales have been worked out to cover a general purpose ration, a high altitude mountain assault (or desert) ration and a cold weather ration. Approximately 4,000 kilocalories are provided daily, equivalent to a fairly heavy work expenditure. Table 2 (below) gives a break-down of the percentages of protein, fat and carbohydrate in each ration.

	GS /1/10/62			PH /1/10/61			M.C.R. MK. V 1960		
	Protein	Fat	Carbo-hydrate	Protein	Fat	Carbo-hydrate	Protein	Fat	Carbo-hydrate
	g.	g.	g.	g.	g.	g.	g.	g.	g.
Food weight	126.2	142.4	535.7	74.3	116.4	623.6	131	234	431
K-calories	517	1324	2196	305	1083	2557	539	2173	1767
Calories p. cent	12.8	32.8	54.4	7.73	27.45	64.82	12.0	48.5	39.5
Ratio P:F:C	1 :	1.13 :	4.24	1 :	1.57 :	8.39	1 :	1.8 :	3.3

Table 2. P:F:C percentages in ratio-scale of Table 1.

All three packs occupy a volume approximately 10 x 4 x 3 inches with a gross weight of about 3 lb. All the rations have been tested in the field by several expeditions and the food items are all commercially available. Other items additional to the packs include matches, toilet paper, razor blades and vitamin capsules (C, A, B, etc.).

Unfortunately, due to optimism and the feeling of "It won't happen to me!" many expeditions do not cater for emergencies. The temptation is always there to keep personal kit to a minimum, particularly when only a short absence from camp is contemplated. Yet, every year one or two cases are reported of accidents and deaths that could have been avoided, or the consequences minimised, by the expedition leader insisting that at all times when away from base all members of his party should carry a personal Emergency Pack. The problem is often on our own doorstep. After all, a cracked ankle whilst walking on open moorland can often immobilise a man for several hours whilst help is obtained, and if adverse weather conditions set in during this period the results of exposure without adequate shelter, warmth, food and drink can be severe, if not fatal.

For use in this country the pack need not be elaborate. Always carry a reserve of food above your normal requirement, also a full 2-pint water bottle containing any drink you prefer except alcohol. In addition carry 7 or 8 ounces of a food containing a high proportion of sugar and make sure it is in a tightly sealed container which you *never* open except in the case of emergency.

For cold weather work the above supplies should be supplemented by a further sealed pack of about 6 ounces containing a fair proportion of fat, which will help conserve body warmth. The quantities stated will allow a minimal personal survival ration for a 48-hour period. Extra water should be carried for hot weather or desert work.

	Temperate-High Energy Expenditure Ration GS/1/10/62	High Altitude Ration PH/1/10/61	Medical Research Council Summer Sledging Ration MK. V 1960
	oz.	oz.	oz.
Oatmeal	1½	2	1½
Skim Milk Powder	1	2	1
Tea/Milk/Sugar Powder	1	—	—
Tea (Leaf)	—	¼	—
Tea (Powder)	—	—	¼
Nescafé	¼	—	¼
Drinking Chocolate	—	—	1—1/5
Glucose/Lemon Drink Powder	1	2	1
Expedition Biscuits Plain	3		2
Expedition Biscuits Wholemeal	3	3	2
Butter	—	1	2
Processed Cheddar Cheese	2	1	2
Chocolate	2	3	4
A.F.D. Fruit	2½	1½	—
Sultanas	1	1	1
Dehydrated Meat Bar	2	—	5
Meat & Vegetable Bar	4	4	—
A.F.D. Vegetables	1	—	1
Potato Powder	2	—	—
Sugar, granulated	3	6	3
Sugar, lump	—	3	—
Enerzade Glucose Tablets	1½	—	—
Rum Flavoured Fudge No. 18	—	1	—
Sweets	—	—	1½
Jam	1	1	2/5
Soup Powder	—	¼	1
Salt	¼	¼	2/5
Curry Powder	—	—	1/20
Marmite	—	—	1/10
Onion Flakes	—	—	1/10
Total food weight and total K. calories	33¼ oz. 4037 K. cal.	32¼ oz. 3945 K. cal.	30¾ oz. 4479 K. cal.

Table 1. Three typical modern ration scales. (All 1 man/1 day)

It may be of interest to consider the developments which have taken place in concentrated rations since the early expeditions of Scott and Shackleton. The following gives nutritional data of typical rations covering the period 1912-1960.

	Nutrients (g.) Protein	Fat	Carbo-hydrate	Food Weight (oz.)	Total K. cals.	% K. cals. for P	F	C	P F C ratios
Scott 1912 (Winter Man Hauling)	211.4	160.7	438.7	33.3	4161	20.8,	35.9,	43.3	1 : 0.8 : 2.1
Shackleton 1923 (Winter Dog Sledging)	184.3	346.0	372.8	35.5	5503	13.7,	58.5,	27.8	1 : 1.9 : 2.0
Watkins 1930 (Winter Dog Sledging)	228.6	377.4	387.7	39.4	6037	15.5,	58.1,	26.4	1 : 1.4 : 1.5
Courtauld 1935 (Summer Man Hauling and Climbing—Short Period)	127	270	269	27.7	4135	12.6,	60.7,	26.7	1 : 2.1 : 2.1
Medical Research Council MK. V 1960 (Summer Dog Sledging)	131	234	431	30.75	4479	12.0,	48.5,	39.5	1 : 1.8 : 3.3
Theoretical Ideal	154	169	560	32	4500	14	35	51	1 : 1.1 : 3.6

* Scott's ration of 1912 was largely based on pemmican and biscuit with only small amounts of other foods such as bacon, cheese, milk products, chocolate, pea flour, oatmeal and sugar. In this ration the protein was excessively high and carbohydrate low; the calories were barely sufficient for winter dog sledging, let alone man-hauling of sledges and there was also almost a complete lack of vitamins.

The Shackleton ration was somewhat improved by the use of a special pemmican which was compounded from various ingredients so as to be almost a complete food in its own right. However, the ration was still largely based on pemmican and biscuit although some consideration was given to the vitamin problem. The fat content was still probably slightly high at the expense of carbohydrate, and although the total calories were high enough, these were provided at the expense of added weight.

The first of the modern polar rations was that of Watkins in 1930 and gave a much more balanced diet with a greater variety of foods although pemmican was still retained. The protein content was perhaps slightly high, as well as the fat.

The ration of Courtauld 1935 gave a better protein balance although the fat was still rather high for summer sledging and climbing.

Perhaps the biggest break-through since the 1930's has been the new technique of accelerated freeze drying which has enabled the manufacture of special meat bars, vegetables and fruit, as well as the adoption of light weight packaging, and these factors combined have enabled rations to be developed with a much greater variety of food-stuffs. The Medical Research Council Polar Sledging Ration MK.V 1960 is a good example of this trend.

THE CAMBRIDGE EXPEDITION TO SOUTH-EAST ASIA 1962

By Charles A. Morris

MEMBERS:

Charles A. Morris: *Leader* (King's), Graduate in Social Anthropology.

Timothy J. H. Chappel: *Business Manager* (Pembroke), Graduate in Social Anthropology.

Stewart Wavell: *Recordist and Writer*, B.B.C. Burmese Programme Organiser and currently Chairman of the B.B.C. Travellers' Tales series.

Antony C. Barrington-Brown: *Cameraman*, also cameraman on the Oxford and Cambridge First Overland Expedition to Singapore in 1956.

INTRODUCTION

One very important point springs foremost to mind. This Expedition originated from an idea about a gap on the cultural and historical map and not from a desire on the part of a venturesome group of undergraduates to have a good summer's holiday at the expense of industry.

Stewart Wavell had come twice within a year to talk to the Cambridge University Explorers' and Travellers' Club first about Malayan Aborigines and later about a recording trip in Burma which he had made under the auspices of the B.B.C. On his second visit, over a prolonged Sunday breakfast, we considered the possibility of an expedition to North-East Malaya and South Thailand, and the targets which would yield the most useful results.

We first consulted Professor D. G. E. Hall as to the value of non-experts collecting material in the field for the use of experts. We asked scholars in Malaya and Thailand, besides authorities in this country, which kind of exploration would be most useful to historians, archaeologists, anthropologists, musicologists and linguistic experts.

Stewart Wavell worked through the Malayan Branch of the Royal Asiatic Society Journals and the Journals of the Siam Society and prepared a comprehensive list of targets. Meanwhile Tim Chappel and I worked out a rough itinerary for the Expedition and started raising the necessary funds. My contact with the Cambridge University Explorers' and Travellers' Club had taught me that amateur recordings and film were often not good enough to be of any real value. We therefore decided that we should only go if we could take a experienced recordist and a professional cameraman, despite the difficulty of raising the extra finance to make this possible.

We wrote more than four hundred letters and the Expedition's correspondence expanded into no less than nineteen different files. For a long time it looked as if we would not be able to raise the necessary £2,500 and that we would not be able to afford to make film as well as recordings. It was not until Whit-Saturday, after five months of preparation, that one post (in five separate cheques) brought the missing £500. Our going was no longer in doubt and we were able to take Antony Barrington-Brown as cameraman.

On July 12th we flew direct to Singapore on a Cambridge University Malayan Association Charter Flight.

WHY

Between roughly the sixth and twelfth centuries A.D. three powerful civilisations flourished in South-East Asia—the Mon at Thaton in Lower Burma, the Khmer at Angkor Vat in Cambodia and the Sri Vijayan in Indonesia. The respective cultures of these centres were, in effect, a mixture of Indian ideas and established local tradition. During this period they met and merged in Malaya and South Thailand. In this area a number of curiously mixed traditions have evolved. The historical development of this part of South-East Asia is of particular interest to scholars and historians.

The two main sources of evidence to which historians usually refer are written material and archaeological material. In this area the evidence which can be obtained from these two sources is limited. The only written material is contained in the Chinese Annals. In Malaya there is next to no archaeological evidence to support the Annals whilst South Thailand, though rich in sites remains largely unexcavated. But there is at least one other important source of historical evidence—the traditional culture of the region, much of which survives only in isolation in small villages. In view of the situation in this area the 'cultural anthropological' approach is clearly the most promising.

The main objective of the Expedition was, therefore, to record and film the traditional culture of the region and to bring back material for scholars to study at their leisure so that more may be discovered about the different influences which have shaped the history of the Malay-Thai peninsula. This involved recording on tape and for filming, dress, dance, drama and music of North-East Malaya and South Thailand. The material would be used to make films for schools and for television and to provide copies of tape and film for those museums and other bodies who are interested in the cultural history of the area, and for those scholars, historians, archaeologists, musicologists and linguistic experts who asked us to examine particular targets on their behalf. We also hoped to write a book on our return.

HOW

The itinerary and timing of the Expedition were considered carefully in advance. We planned to arrive in each State or Province on a fixed date, having warned the relevant authorities of our proposed programme and time of arrival. In Malaya we were able to meet the State Secretary immediately on our arrival in each State and to draw up a day to day schedule working in close co-operation with District Officers, Information Officers and Headmen. This method ensured that we wasted a minimum of time in arranging performances and contacting story-tellers and shadow-play masters. We adopted the same procedure of 'advance bookings' in all three States. State officials gave up much of their time to assist us in achieving our aims and acting as interpreters and translators.

Luckily we were able to stick to our schedule. Our time was divided equally between North-East Malaya and South Thailand. As the roads in Malaya are very good, we worked as a mobile unit of Land-Rover and trailer, capable of covering a large number of targets in the five weeks available. In Thailand we had to rely entirely on the railways and local transport. We did not know so much about our targets there and, accordingly, our plans had to be more flexible.

After two members had returned the vehicle to Kuala Lumpur, the Expedition rejoined at the new Haadyai Television Station on August 20th. There we met Mr. Vichit Chandrakul, our interpreter from the teacher's training college at Songhkla and Mr. Chin Youdi, a Curator of the National Museum who were to accompany us in the South. Vichit's contacts were endless and Mr. Chin is an acknowledged authority on the area.

We spent four weeks in South Thailand working our way north by stages, spending between three and five days in most centres and including two separate trips to visit small bands of Negritos in Yala and Pata Lung Provinces. Such is Thai hospitality that as often as not we found ourselves the guests of either the local authorities or a private individual. We lived in schools, a television station, a radio station, provincial education headquarters, a mission hospital, a village police station and even a King's palace, now a national museum. Everywhere we went we were entertained lavishly as this is 'Thai custom'.

In Bangkok, where we spent a week, we were the 'guests' of the Fine Arts Department. Its Director-General Mr. Dhanit Yupho, put at our disposal the wealth of the traditional culture fostered and maintained by the Department.

He also arranged that we should visit the fascinating sites of Ayuthia, the ancient capital of Thailand, and Lopburi. We were extremely lucky, too, to have a three-day trip to Chiengmai in the North, where we were able to make further recordings and film, this through the kindness of the Head of British Information Services, Bangkok, and the United States Air Force.

On September 22nd we returned to this country.

WHAT

Our principal targets in both countries were the recording and filming of the traditional dance, drama, shadow-plays, dress, ritual, music and traditional stories. Our time throughout the ten weeks was fully occupied in achieving these aims. Not only had we to make full arrangements for a performance and then record and film at length but we had also to find time to discover the plots of the stories and gather any useful information about each item and, where possible, to play back the tapes to an interpreter for translation.

In Malaya we found a wealth of traditional culture in all its forms. We were able to send some sixty tapes of recordings to Radio Malaya for dubbing before their return to the B.B.C. in London, and to post off 4,500 ft. of film from Kuala Lumpur at the end of our five weeks on the East Coast.

This material covers many forms of the traditional culture, ranging from story-telling, lullabies and the cures of 'Pawangs' and 'Bomohs' to full-length recordings of the Wayang Kulit shadow-plays and evening performances of Makyong and Menora, the ancient form of opera. In all we recorded over forty hours of material. Our most consistent difficulty in recording was that of trying to balance orchestras and singers at the start of a performance without causing offence. This process always required the utmost patience and tact. Other recordings included Silat—the noble art of self-defence—in its many forms, Bergayong Ota Ota—a ceremonial sword-dance, the Trengganu Royal Nobat orchestra, Dzikhir Bharat—the inter-village improvised singing competition, the beating of Kertok and Rebana Besar, Main Putri—the calling out of a devil from a sick person and a Kelantan 'Bomoh' putting his partner into a trance and calling all the spirits to banish the evil spirit from a sick household.

Our recordings are at present with the B.B.C. and the best material is to be digested on to long-playing records. The film is at present being edited for a number of different purposes. The story of the Expedition is being written by Stewart Wavell in a book which is to be published by Allen and Unwin Ltd. and the Athenaeum Publishers, New York.

(Copies of the Expedition Report and the list of tapes as recorded in the field are available from Charles Morris, 5 Merton Street, Cambridge. Ed.)

SOUTHERN ETHIOPIA 1962

By Edwin Herbert

OF THE thirteen provinces of Ethiopia, it was Bale province that intrigued us most. Its boundaries, marked by the Ganale Doria, the Webi Shebeli, and the Kenyan frontier, enclose an area of about 50,000 square miles. In western Bale lies the second highest and least explored mountain range in Ethiopia. This range links up with a lower mountain group to the east, forming a horseshoe-shaped barrier protecting the upper reaches of the River Dumal. Thus interesting zoogeographical features are to be expected in the valley. As indicated on the best available maps the river has only western tributaries despite high ground to the east. Apart from a few contour lines the only features shown in this region are three springs; one of these is marked as running uphill. No mention of the Dumal Valley or of the eastern range was found in the literature.

The main object of the expedition was to reach the upper Dumal Valley and there to set up a base camp from which a general scientific survey could be made. As we had no funds to hire pack-mules, we were unable to do this and had to set up our base camp not far from Goba, the airstrip where we landed. The head of the valley lay to the south-east, a mere fifteen miles away. Our programme consisted of four separate projects. Firstly, we intended to carry out a zoogeographical survey of the region near the base camp. Secondly, we proposed to investigate any hot-springs in the field area. Although there are reports of hot-springs in Bale, the springs we examined were only physiologically hot. The project was replaced by an examination of several mineral springs and a general soil survey. Thirdly, we proposed to make a botanical collection and to investigate the alkaloid content of delphinium species in the area. Finally, it was intended to collect rock specimens for palaeomagnetic studies. We hoped to spend seven weeks in Ethiopia; despite several delays we managed to spend six weeks there.

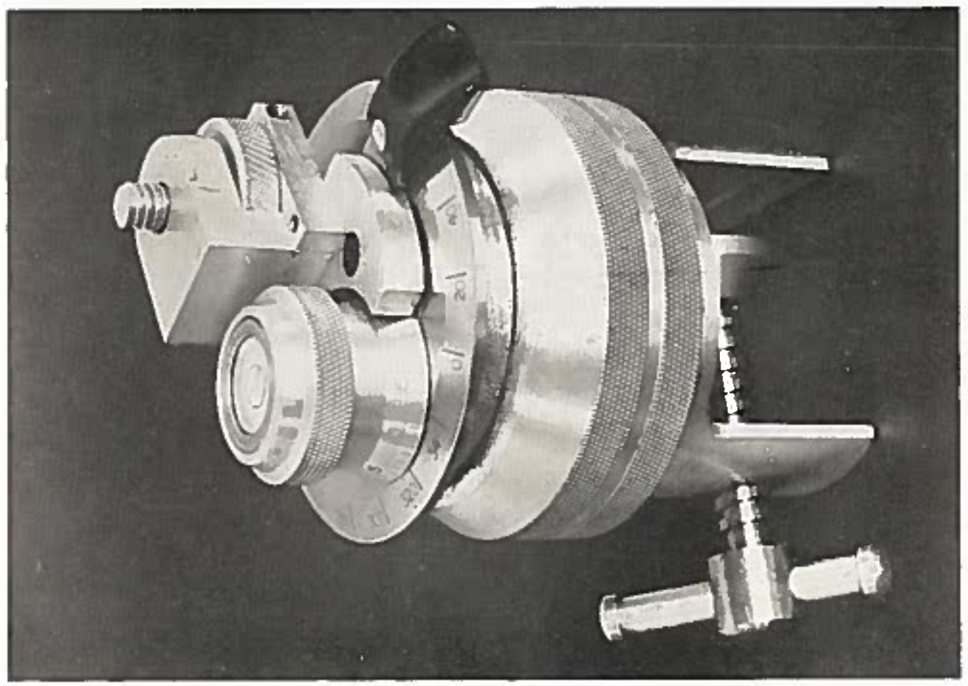
The expedition team consisted of eight members: myself, leader and organic chemist; Anthony Williams, metallurgist and transport officer; Robert Hamilton, surveyor and mechanic; William Sowerbutts, pedologist; Ian Outram, Peter Barrer, and Christopher Hinks, zoologists; Neraiu Teklemichael, biologist and interpreter. The assistance of the latter, a third year student from the University College of Addis Ababa, was invaluable.

Our travels began with a 3,150-mile drive to Akaba in Jordan, followed by a long cruise down the Red Sea to Djibouti, and then a 490-mile train journey across the Somali and Danakil Deserts. The last stage was a flight of some 160 miles from Addis Ababa to Goba, where we arrived five weeks after leaving London.

Two years ago, Goba was made the administrative headquarters of the new province of Bale. The resultant further influx of Amhara officials has increased

Edwin Herbert participates in a botanical ritual to the amusement of two young Galla.

"Man Overboard!" — an everyday occurrence on the Sicily Expedition.



The Smith-Guile Pan-Head, Mk. II

the cost of living but food is still cheap by European standards. Surplus produce is brought in from surrounding districts and sold at the market held several times a week. Chickens, eggs, mutton, flour, sweet-corn, and bananas are available. "Gisilla" cigarettes cost only fivepence for twenty, an air freight charge of three halfpence sometimes being added. Besides being a centre of trade and administration, Goba is the chief garrison town of Bale and nearly 1,000 policemen are stationed at the police training camp. Once a month there is a rattling of chains in Goba as the seventy major criminals detained in the doubly fenced prison are taken down to the river to bathe. Banditry is a problem in most districts of the province.

Some of the Ethiopian customs seemed strange to us at first. For instance, it is customary for the women to carry loads and we were much laughed at for carrying rucksacks on our backs. We also found that it was considered impolite to give a gift immediately in exchange for a present received. We were invited to several meals of the typically Ethiopian dish of *wat* and *injera* to celebrate the end of the fifteen-day fast before the Feast of the Assumption. The Amhara are, of course, Coptic Christians and fast for about half the days in the year. *Injera* is an unleavened bread pancake made from the cereal *t'ef*. It has a sour taste due to its tannic acid content. *Wat* consists of red peppers (Capsicum sp.) mixed with other spices, peas, or meat. At feasts, extra pepper is added to stop guests eating too much. It is good manners to take one more course after saying that you have finished.

An Australian Methodist missionary at Goba explained to us that although a casual visitor is well treated and his ignorance of local customs forgiven, it was more difficult for a resident to foster friendly relations as he had to be very careful not to offend the people. The Galla consider that the greatest crime is anger and it was therefore somewhat awkward for him to scold a child at his mission school. Correspondingly, the greatest virtue is considered to be forgiveness. The nurse at the mission clinic told us that the hard environmental conditions made the Galla tough and resilient. Axe wounds were common but they tended to heal up in a remarkable fashion. She had once broken two needles trying to sew up a cut in a herdsman's sole. Typhus and glandular fever were rife.

Three days after arriving at Goba, we set off in the police Mercedes lorry to travel as far as possible towards the mountains. This transport was provided free and we were given an escort of a lieutenant, seven constables, and two guides. We stopped at a *t'ej bate* to buy our task force a flask or two each. The bar had the usual low tables and benches, and as in Addis Ababa, the servers were women albeit they did not seem so 'friendly' here. The normal drink taken is the honey-based *t'ej*, for which the leaves of the shrub *gesho* are used as the fermenting agent. A non-alcoholic honey drink called *birth* is also popular. A very cheap beverage is *t'alla* which is brewed from barley; its taste is bitter and gritty. The selection is completed by *areche*, a clear alcoholic distillate sometimes flavoured with aniseed. There are a surprising number of *t'ej* houses in Goba.

After a long detour to reach the Italian-built bridge over the Togona, we climbed up into the old town. The track soon faded out and the vehicle lurched on across rough ground. Eventually we came to a clearing on the east bank of the Togona, at the point where it receives a small tributary, the Kafficha. Having exchanged greetings with the local chieftain, we set up the base camp at 9,500 feet and dug trenches around the tents before the afternoon rains began.

During the next month, we carried out a scientific survey of an area of about eighty square miles, ranging from the cultivated plains north of Goba (8,700 ft.), to the barren afro-alpine regions of the Saneti Ridge (12,900 ft.). The most prominent landmark of the area was Mount Fasil (11,400 ft.). The gorges of the Shaya, the Togona, and the Micha proved to be of particular interest. The Shaya is a small but powerful river that has cut a ravine in places at least two hundred feet deep but only fifteen feet wide. It is not possible to see the water as trees growing from the almost sheer rock face of one side touch the opposite bank. The Togona shows clear signs of glacial erosion.

The surface geology of the area consisted of two successive tertiary lava flows. The older basalt flow outcropped north of Goba whereas to the south this flow was covered by a layer of coarse volcanic ash that had been eroded before being covered by the younger basalt flow. The soils were in general poorly drained heavy clay types derived from the recent basaltic lavas. They contained few insects but had a high proportion of organic matter. In and north of Goba a black clayey loam had developed; to the south there existed a brown sandy loam. Although the soils are potentially very fertile no crops are grown on the mountain slopes due to cold and exposure. Cultivated areas are confined to the lower valleys and to the plains.

The upper valleys are mostly juniper-covered but clearings of pastureland are still found. *T'ed Juniperus procera* is the predominant tree, with groups of *kosso* (*Hagenia abyssinica*) occasionally occurring. There is a very small bamboo belt which was probably hand-planted and is not well developed. The floral layer in the valleys at this time of year was varied and colourful. Eighty species were collected, many of them being of typically temperate genera. Lilies, orchids, and red-hot-pokers flourished and towards the end of our stay a fine blue delphinium flowered. Above the tree line at 11,300 ft. lie the desolate mountain moorlands supporting herbs and small shrubs on the rocky slopes and ferns and sedges in the marshy depressions. Giant lobelias grow on the highest ridges. There is heavy rainfall, much mist, and the night temperature is usually below freezing point.

The fauna of the area can be only briefly mentioned. The African wild cat was common on cultivated land. Several antelopes and servals were seen in the upper valleys and traces of hyenas, mongooses, and mole-rats were found. The black and white colobus monkey was conspicuous in the juniper forests. Baboons frequented the steep, wooded gorges; the metallurgist, whilst panning in the Togona to study rock decomposition products, had his spatula stolen by a baboon. Chameleons and lizards were fairly common. Toads and frogs, including several species of tree-frog, were abundant. Only four species of ant were found and the beetle and spider collections made were not large. Heteropterous species were very restricted at this altitude and orthopterous specimens were mostly immature forms. Little specificity was observed between insects and plants.

An unexpected discovery was that of some thirty-five rock-hewn shelters in the volcanic ash of the Micha Gorge. Most of them were not found until near the end of our stay. Two of the shelters contained symbolic rock-engravings and many of the roofs were blackened with soot deposits. One group consisted of a series of cells linked by a tunnel excavated at the back; various seats and steps had been cut in the rock. Ploughing on the hill of Safagara, where there are pits and earthworks, a

farmer recently found some charcoal and pottery and a bible that quickly decayed on exposure to light. This was the site of a Coptic refuge village destroyed by Imam Ahmed-al-Ghazi in the sixteenth century. The cave sanctuaries are probably of the same date and may have been used by Christian hermits hiding from the Moslem invaders.

The mountain Galla were at first less friendly than the Gobans but after they had become accustomed to us, they proved very hospitable. They are superficially Moslems but have many pagan beliefs. Their typical family compound consists of two or three dome-shaped huts surrounded by a corral of thorn branches. The huts have walls up to six feet high and are usually divided into two by screen. In the half nearer the door animals are kept at night; in the inner half are the beds and an open wood fire that is kept continuously smouldering. The wooden framework of the roof has a pleasant shiny appearance due to its covering of smoke deposits. The only light in the hut is from the embers. The beds consist of animal skins supported by interwoven leather thongs. It is the custom to offer milk to travellers from a gourd; the milk was refreshing but often covered with a layer of scum. We found a form of porridge served with clarified butter to be very filling.

Towards the end of August, daily thunderstorms appeared to herald the onset of the Rains and as the Dakotas sometimes cannot land for several weeks in the wet season, we abandoned camp and returned to Goba. In fact the missionary has since informed us that after a few heavy showers the weather became fine and frostly and the main rainy season failed to materialise.

As the Dakota rose into the turbulent air and the patchwork quilt of the Goban landscape shrank away, we realised that our field work was now over. In addition to the survey, we had carried our field trips from Addis Ababa to Mount Entoto and to the Blue Nile Gorge. Two of the zoologists had flown to Dollo at the southern end of the Dumal Valley and an archaeological party had visited Ghinnir, the old trade centre of Bale. On these short trips our curiosity had not been assuraged by the few results we had obtained; on the contrary it had been sharpened by further tales. At Dollo the governor had told the zoologists of a poisonous snake with legs, known only locally, and of a cave one-and-a-half days' journey to the north in which animals and birds had been carved from the rock. At Ghinnir, permission had not been given to visit Magalo, where the Webi Gestro flows through a mountain for an underground course of over a mile, carving out a series of limestone chambers described by a nineteenth century traveller as one of the natural wonders of the world. There is a reliable report of a hot-spring at Magalo, which is presumably caused by volcanic activity. Yet the site is far away from the Rift Valley.

The panoramic views we had seen from the air made us realise how little of Bale we had covered. We had seen grey peaks towering on either side of the heavily forested, virtually unexplored Dumal Valley. We had looked down on desolate tablelands left by enormous ravines and on monumental residual plateaux rising from wide valley floors. Yet there was no more we could do now; our field-work was over. What we did not realise was that the most morale-breaking part of the expedition was still to come.

HOT CLIMATE HAZARDS

By Dr. Charles Leithead

IN a winter's fireside fancy, explorers in hot climates are surely among the most fortunate of men. And since the human body is adapted better to lose than to conserve heat, this rather biased image is not entirely illusive. Nevertheless in high ambient temperatures, there are some hazards for the unacclimatized or unwary traveller.

Hot climates are those in which cooling by the evaporation of sweat is required more or less all the time to keep the body temperature within normal limits. It is difficult to be more precise because the total heat load, which is the stimulus for sweating, is in part imposed by the surrounding temperatures and in part produced in the body by normal metabolism and physical exercise. Extreme and sustained effort will provoke thermal sweating in relatively cool surroundings, whereas even a resting man begins to sweat when air temperatures approach 90 deg. F. The need for sweating throughout at least the hottest part of each day is itself no perfect criterion by which to consider or predict possible health hazards, for the rate or amount of sweating which is required is also important. It happens that few if any naturally hot climates are dangerous to young fit men at rest; usually such men are at risk only if undertaking strenuous or even moderate exertion.

Climatic heat may be dry or humid, with appropriately different hazards for the traveller. In desert regions the air temperatures may be very high (120 deg. F. or more) and there is usually additional burden of radiant heat from the sun, but sweat evaporates easily and provides thereby a remarkably efficient channel of heat loss; the principal and very real danger to the traveller is lack of water. In a hot moist climate cooling may be a problem because sweat is less well evaporated and the skin, which is almost continuously wet, becomes macerated and is readily damaged and infected; and since there is usually little fall in the surrounding temperatures at night, sleep may be difficult and is seldom refreshing. Of the two climates, the desert is certainly the less trying, but is potentially the more hostile and dangerous.

It is well known that we become acclimatized to significant and sustained changes in environmental temperatures. Exposure to unaccustomed heat provokes, among other things, considerable dilatation of food vessels in the skin and the removal of large amounts of body water in sweat; and to some extent, acclimatization is represented by physiological adjustments which make allowance for the new state of affairs and restore order to the circulation, the body-water balance, and thermoregulation. Order is restored generally within a week of the initial exposure, but acclimatization is not then complete; there are long-term changes mainly in behaviour as a result of increasing knowledge of how to avoid unnecessary activity or exposure and of how to conserve water, and there may also be further physiological adjustments so far unidentified. It is important to appreciate that acclimatization is relative; a man adjusted to sedentary work in hot surroundings is not adjusted to hard physical exercise in the same environment nor to sedentary work at high temperatures. Physical training is essential to really useful acclimitization for it imposes its own heat load to which the body adapts; explorers intending for example to travel across deserts should be in peak physical condition at the outset, and then grade their activities in the heat to reach maximum performance about the 7th to 10th day of exposure. On the basis that the ability to endure hardship or privation is enhanced by previous experience, trials of this nature are sometimes included in training programmes; there is little to be said for the practice and it must be emphasized that it is concerned with training the mind and not the body. To the best of our existing knowledge, the body cannot be trained to lower its minimum requirements of water or food.

The health hazards which are directly referable to high environmental temperatures are not difficult to understand. The first and obvious possibility is that the environmental heat load might be so great that the body temperature rises progressively although the heat-losing mechanisms are fully operative. This hardly ever occurs in practice except in industrially or otherwise unnaturally heated places. In most instances in naturally hot climates, young men suffer heatstroke only when some extra burden has been put, voluntarily or involuntarily, upon the processes of thermoregulation — for example, strenuous and unaccustomed exercise in the heat on the part of an unacclimatized individual, dehydration because of lack of drinking water, intercurrent febrile disease, a large intake of alcohol, or the taking for some good reason of a drug such as atropine which happens to suppress the production of sweat. Alternatively the proper delivery of sweat to the body surface may be prevented by skin disease, or its evaporation impeded by a high environmental humidity or by unsuitable clothing. A useful tip is that the earliest symptom of heatstroke is often strange and aggressive behaviour; the fully developed case shows a very high body temperature, cessation of sweating, and delirium, convulsions or coma. Treatment, which is urgent, is to cool the patient by sponging or spraying with water and by fanning to promote good air movement and therefore evaporation of the water on the skin; chilled water is an advantage because cooling then takes place also by convection. Heatstroke is the most serious of all the medical effects of heat, and fortunately it it rare; it has been described here mainly in the hope that the information offered might serve some readers in an hour of need.

Most of the other disorders are often lumped together under the title of heat exhaustion, and for present purposes at least this is not an unreasonable approach. They arise, broadly speaking, as byproducts of the normal functioning of heat dissipating mechanisms. Thus the dilatation of the blood vessels in the skin which occurs almost immediately on exposure to unaccustomed heat upsets the stability of the circulatory system; and unacclimatized individuals are therefore prone to giddiness or even fainting when they exercise, stand still for long periods, or change posture suddenly from lying to standing. This disorder is common, but it is mild and self-correcting. Depletion of body water or salt causes heat exhaustion syndromes of more substance; that they occur at all is because sweat is essentially a very weak solution of salt in water. Serious failure to replace the water lost in sweat is prevented in normal circumstances by the onset of thirst, and it is encountered therefore only when water is in short supply; the symptoms include giddiness, mental disorientation, and inco-ordination of the gait, and there is a rise in body temperature. It is known that a slight degree of water depletion, which is called voluntary dehydration, may develop before thirst becomes urgent and particularly if palatable fluid is not easily and immediately available; voluntary dehydration has no symptoms but has a detrimental effect on the circulation and on thermoregulation. Failure to replace the salt lost in the sweat is often of little or no consequence, because physiological adaptations occur which reduce the salt contained in the sweat and urine to negligible levels; but particularly in unacclimatized visitors to hot countries, these adjustments are on occasion apparently inadequate or too late to prevent clinical salt depletion. The symptoms of salt lack include fatigue, giddiness, loss of appetite, nausea, vomiting, and muscle cramps.

It is understandable also that the skin may fail sometimes to withstand the stress of environmental heat. Constant wetting by sweat is perhaps the principal reason why travellers particularly in the humid tropics are liable to suffer from prickly heat. This is a rash consisting of numerous tiny vesicles set on a red and inflamed skin, and accompanied by a curiously unpleasant prickling or tingling sensation. It is more of an irritation than a hazard, but it interferes with sleep and readily becomes infected and pustular; and since the ducts which transmit sweat to the skin surface are obstructed, there is a danger in this and similar rashes that sweating will be significantly impaired. In this respect sunburn also deserves mention, although it is not strictly speaking a heat disorder.

While modest fame or considerable fortune awaits the discoverer of an efficiently preventive or remedical application for prickly heat, it is by no means difficult to guard against the other heat disorders. The principal measures are the taking of adequate amounts of water and salt to replace sweat losses of both, the wearing of clothes appropriate to the environment, and the avoidance of unusually strenuous effort in the heat of the day. The question of what is an adequate allowance of drinking fluids is a vexed one. Physiologists have studied mainly the water losses of volunteer subjects at different tasks in a reasonable but limited variety of hot conditions. Therefore even in the unusual event that the expedition planners are furnished with accurate predictions of energy expenditures and climatic conditions, precisely equivalent experimental data may not be available. And since human experiments rarely carry by intention any serious risk, it must be admitted that the evidence obtained usually represents in this respect the average amounts of fluid taken or lost by groups of subjects maintained, with a fair safety margin, in health. We have of course some knowledge of the lower limits of water requirements, gained frome somewhat bolder experiments, and from people who have experienced and survived water lack. We know also that sweat losses may amount in severe circumstances to 2 pints or more per hour.

With these considerations in mind, it can be said that in hot and dry surroundings such as a desert, the smallest allowance for drinking fluids should be 1 gallon daily per man; and 2 gallons would be a much more comfortable ration. Once in the heat and on the job, the fluid intake can be judged adequate if it meets the requirements of thirst, keeps the individual in health, and maintains a daily (24-hour) urine output of more than 1 pint. Collecting and measuring the odd daily output of urine is a simple procedure and a very informative one. As to the kind of fluid which should be supplied, recent and excellent research in Israel has shown that from a large variety of drinks available, troops marching in the desert chose citrus-flavoured water chilled to 10-15 deg. C. (50-59 deg. F.); and this was preferred, be it noted, even to free beer.

Since a vehicle is easier to locate than a man, travellers stranded in a desert should not abandon a car which has stuck or ceased to function. If however there is no hope of rescue, walking should be undertaken only during the night and early morning and water should be carried in preference to food. As much water should be taken as can be carried, and any surplus can be used to satisfy thirst before starting. It should be remembered, if water is short, that there may be some in the radiator of the vehicle. No useful purpose is served either by overdrinking at the outset or by conserving the water until collapse seems imminent; it should be taken

Continued on page 38

THE SMITH-GUILE PAN-HEAD

By Peter Guile

IN the field of glaciological research, a long-term study of the behaviour of glaciers is obviously the most beneficial. By sending out expeditions at regular intervals, Peter Smith always hoped that Imperial College could carry out such a long-term project on the glaciers of Jan Mayen. Although the expeditions would be fully occupied in undertaking a systematic investigation of a single glacier, it is essential to obtain accurate records of the ice conditions of all the glaciers in an area of such extreme glacial activity. Only in this way can the trend in climatological regime be traced.

Peter Smith envisaged that these accurate records would be best achieved by taking rounds of panoramic photographs at intervals from identifiable viewpoints (and including other fixed points). These could be undertaken by recce parties; though with the normal heavy surveying equipment (phototheodolite and tripod), under difficult mountaineering conditions, the idea was completely impracticable.

Much thought was given to the problem and then one day, at an early stage of preparation for the 1961 Beerenberg Expedition, Peter said to me: "What we need is a small mounting head, which can be clamped to an ice-axe. To this we can attach a camera for taking a series of photographs forming a 360 deg. panorama". The idea of the "Pan-head" was born.

The full specification called for a lightweight, compact and robust instrument which could be clamped to the head of an ice-axe, the shaft of which was firmly embedded in snow or in a pile of rocks. The mounting head was to incorporate a levelling device and a graduated panning table to which an ordinary camera could be attached. It was also to incorporate provision for elevation or depression of the camera, while maintaining a horizontal panning movement.

About nine months later, after countless designs had been prepared and many hours spent in the workshop, we had produced two prototype models (Mark I) for the Expedition. These involved several features novel to instrument design, including some unusually difficult machining problems.

Unfortunately, one of the pan-heads and its film was lost in the accident in which Peter Smith so tragically lost his life, but the results obtained from the surviving model fully justified his confidence in the value of the method and in the instrument. Even so, many modifications have been made to the original model and the Mark II has now been developed. (See page 30).

The Mark II instrument is fixed to the head of the ice-axe by means of a clamp upon which is mounted a ball-socket. The panning table, located on the ball-socket, is levelled using a circular spirit bubble and is held in position by a screwed ring clamping on to the ball. Set inside the ball, for compactness, is a mechanism for indexing the panning table. By this means, the table can be turned through any angle and can be read accurately to the nearest degree. The mechanism is operated by a knurled screw outside the ball, the angle being set visually against two scales. There is sufficient friction and mechanical advantage to make a locking device unnecessary.

On the panning table, there is a cam-operated tilting platform which carries the camera and allows a horizontal panning movement with a camera elevation or depression of up to 15 deg. All parts of the instrument, except for the internal mechanism and one part of the body, are made of aluminium alloy for lightness. The complete instrument weighs only 16 ounces and will fit into a case 2½ inches square by 3¾ inches.

The pan-head has attracted much interest from outside sources, both for glaciological and general survey purposes. As a result, orders have been placed by the Royal Geographical Society, the British Antarctic Survey (BAS) and the Australian National Antarctic Research Expedition (ANARE) for the improved Mark II model. These instruments have been constructed in the Civil Engineering Dept. Workshop of Imperial College. By March, the pan-heads will have travelled many thousands of miles, to the top and to the bottom of the world. We are proud that the instrument will constitute a permanent reminder of the enthusiasm and imagination with which Peter Smith always pursued his researches.

Hot Climate Hazards .... **Continued from page 36.**

rather in small amounts at regular intervals. For every gallon carried, a man should be able to walk about 20 miles.

The current advice on salt requirements is that the temperate-climate or accustomed salt intake should be continued on entry to heat—which means in particular that if the total intake of food is for any reason diminished, the intake of salt should be selectively maintained at about 10 g. daily. On the other hand, unacclimatized men who are working hard right from the start of their exposure to heat are well advised to add at least 1 teaspoonful of salt daily at table to their food, but may gradually decrease this addition as they become acclimatized. No extra salt should be taken when water is in short supply. Finally, ordinary table salt is to be preferred to salt tablets, which have few advantages and many failings. If sugar-coated salt tablets are carried, thir use should be restricted to the prevention and not treatment of symptoms; for their disintegration in the bowel is intentionally delayed, and in the presence of diarrhoea they frequently pass through virtually unchanged.

Clothing chosen for hot climates should be of lightweight material, loosely fitting, preferably of a light colour, and it should be kept to the desirable minimum. In order to facilitate the evaporation of sweat, as little clothing as possible should be worn in humid heat. On the other hand, it is wiser in the desert to cover most of the skin surface as a shield against radiant heat coming from the sun or reflected from the sand. Care should be taken to avoid sunburn, and the skin should therefore be tanned by graded daily exposures. A wide-brimmed hat or peaked cap may be worn to prevent sunburning of the forehead and to protect against glare; for the latter purpose it is not essential provided that sun glasses are worn instead.

Perhaps the best way of concluding this somewhat melancholy account of hot climates is to restore a proper perspective. And that is as follows: in naturally hot climates, most fit young men adapt without conscious effort and know no physical limitations, provided that they observe the rules.

SICILY 1962

By Brian Matthews

FOLLOWING the 1961 Malta Expedition, we thought that sufficient experience had been gathered to tackle a more definite problem in submarine archaeology. Miss Joan du Plat Taylor of the Institute of Archaeology, who is particularly interested in submarine work, suggested Motya, a Phoenician settlement near Marsala in Western Sicily. At first sight for a team of divers trained for deep water, this island, situated as it is in a lagoon of average depth about 3 feet, was not an ideal choice. However, archaeologically, it is an almost unique situation.

The Phoenicians were a nation of traders. They were not a warlike race nor a nation of philosophers; they were concerned more with day to day transactions and offerings to the gods than with writing histories. They wrote little to tell us how they lived, though ironically enough they are assured of a place in history. For it is the Phoenician script which has become, through its adaptation by the Greeks, the direct source of all western writings up to this day. Any information concerning Phoenicians and their settlements is therefore of great interest.

As explorers in antiquity, the Phoenicians were second to none and in the interests of trade, they founded many colonies. Initially a trading station, Motya soon developed into one of the three main strongholds of Phoenician power in Sicily. Although active in trading and cultural relations with the Greeks, Motya faced repeated clashes with them and in 397 B.C. the Greeks decided to destroy this trade rival. A dramatic siege ended in the fall of the island, providing the final chapter in its history. The inhabitants moved to Lilybaeum (now Marsala). The site of Motya was abandoned and has never since been fully re-occupied. It is for this reason that it is probably unique to archaeology.

The island is roughly circular in shape, 1½ miles in circumference and connected to the mainland in true Phoenician fashion by a submerged causeway. The primary task of our expedition was to examine this causeway in detail together with the Cothon (or artificial inland harbour). The causeway, some 1500 yards long and one to three feet below the surface, is still used by the high-wheeled Sicilian carts. We surveyed the track by a pacing technique. Stations set up by the land surveyor provided the starting point and the distance and angles between successive ranging poles were measured. For this work, a coloured flexible fibreglass tape proved invaluable. Progress through the waist-deep water was slow and several days were taken to pace the causeway.

The track, where it exists, consists of a central part six feet wide with grooves in its surface worn by the passage of carts. To each side of the central way, a bank of rough, tumbled stone extends for some ten to fifteen feet presumably as a protection. The road leads straight through the North Gate of the walled city. The part of the causeway near the island is covered by a layer of mud which we probed with metal rods in order to follow its course. Nearby, a submerged L-shaped wall was discovered and surveyed. It has now become apparent that a small harbour must have existed there using the causeway and the land as two sides with the L-shaped wall forming the seaward protection.

Towards the mainland, the causeway peters out into a sandy area stretching 300 yards to the foreshore and it cannot be followed further even with the use of probes. It is possible that the Phoenicians started to dismantle the track during the siege of 397 B.C. On the other hand, the water level may have risen in the lagoon since then by about 18 inches, thus accounting for the discrepancy in the length of the causeway and the fact that it is now submerged. However, if the lagoon was shallower than at present it would certainly have been unnavigable to even a shallow draught vessel, though considerable silting has probably occurred since ancient times.

To investigate this problem we decided to take core samples of the lagoon mud. This is a new technique we are applying to submarine archaeology which could prove as important as trenching is to land excavation. Core samplers, 2in. diameter polythene tubes, were pushed into the mud, a cork inserted into the top and the the mud core withdrawn. The samples obtained are now being examined and it is hoped, from the dating of the muds, to follow the progress of the silting through the centuries. As yet we have no positive data concerning the cores though we did notice one fact which will have a bearing on the results.

The gap at the south entrance of the lagoon between the mainland and long island is about a mile wide at the present day; yet early writers noted that they had difficulty in finding the narrow channel leading to the lagoon. From the long island, stretching almost completely across the entrance, we noticed a weed-covered reef lying about 18 inches below the surface. Only a narrow channel 100 yards wide exists between the reef and the mainland. If now the level of the water fell by 18 inches only the narrow channel would be submerged; with this channel the flow in and out of the lagoon would scour the entrance and keep the way to Motya navigable. The Romans noticed this strong current when they tried to block the entrance against invaders and also mentioned that the latter was narrow and difficult to find. It is hoped that the mud cores will give clues in sorting out this problem.

We were fortunate whilst working at Motya in having available the help and advice of the joint London-Leeds University land archaeological expedition. Both parties learned much of the difficulties and techniques involved in the other's tasks, and in many cases were able to help each other. One of our zoologists spent some time examining bones and shells from the land excavations. Examination of zoological remains found in excavations on the seashore will also help to clarify the problem of the sea level changes. In addition to a general survey of the lagoon we carried out zoological transects across the beach and into the lagoon. Filming our work on Motya was only possible with film made available by the archaeological photographer as our own film did not arrive until later.

After completing our work at Motya we moved to Favignana, one of the Egadi group of islands about 3 miles off-shore. It gave us the chance to work in deeper water where archaeological remains were most likely to survive and where zoological work had greater scope. Down to 180 feet, we intended to complete a zoological survey using a technique pioneered for submarine botanical work by the Azores Expedition.

This technique involves the collection, from different levels down a submerged cliff face, of all samples within the area enclosed by a standard *quadrat* (about 1 square foot). A vertical line with markers at fixed levels was first taken down the cliff by a pair of divers. Then, using an 'inclinometer' of our own design (a scaled formica board as protractor and a weighted pencil as plumb), we took the profile of the reef from this line. Divers later descended to collect all the vegetation and shells within each quadrat area. The four separate quadrat samples for each level were collected in carefully labelled polythene bags. As a result of strong currents, which made diving too dangerous at certain phases of the moon, and later, a breakdown of the air compressor, the survey was not as complete as desired. However the work was completed to a depth of 100 feet with general collecting down to 160 feet. The specimens are now undergoing detailed examination and it is probable that several species hitherto unknown in this part of the Mediterranean will come to light.

The waters around the Egadi Islands were the scene of a great sea battle which eventually led to the fall of Carthage. The area is probably littered with remains. One of these wrecks was pointed out to us by local fishermen and we attempted a scientific survey. The importance of a wreck now lies in its plan and distribution rather than in single pieces of cargo. In examining a wreck it is essential to overcome the desire to remove some of the amphorae before the examination is complete. This may be difficult with a fisherman offering £5 for a wine jar or an American as much as £300.

After a close look at the pile of amphorae littered about the base of the submerged reef in 100 feet of water, we worked out a new technique for obtaining the overall plan of the site. A nylon line about 100 feet in length was stretched along the bottom of the reef through the amphorae. We made a 10-foot square from slotted angle and placed this beside the line. Then, using the square as a standard area, we sketched on to a formica board, in pencil, the positions and sizes of all objects of interest within the square. The next pair of divers moved the quadrat along the line and made a further sketch. In this way and by photographing the work at intervals, data for a plan of the whole area was gathered.

All this took time with a sea journey of two hours each way and only two dives to 100 feet allowed for each diver per day. Training and teamwork helped the work to proceed smoothly at this depth where every second is important and every breath accumulates more nitrogen into the bloodstream. From the laboriously gathered data a map is being drawn from which information on the possible cause and date of the wreck can be estimated. Photographic work was greatly assisted by the first commercial underwater camera which we were using alongside conventional cameras in water-tight cases. After completing the underwater survey we raised one of the amphorae to examine it and its contents. An octopus, a peach stone with a small amount of flesh still clinging to it and many shells were found inside along with much sand. The peach-stone and shells are being examined. The amphora was dropped back overboard; the octopus was delicious.

Now that we have returned home we are fortunate in having a record of our efforts by way of a short colour film. As it had not proved possible to obtain a watertight case for the cine-camera all sequences were taken above water. However by the addition of a few still submarine shots and a sound track with the help of Messrs. Martini and Rossi Ltd. we hope to produce a short feature film of our Expedition. By this permanent visual record we hope that other expeditions will be able to learn from our mistakes and achievements.

THE INSTITUTE OF ARCHAEOLOGY

By Miss J. du Plat Taylor

We are hoping to publish a series of articles on the work of the numerous institutions concerned with the more specialised aspects of exploration. Examples are the Scott Polar Research Institute, the British Museum (Natural History), the Medical Research Council etc. This article on the Institute of Archaeology is the first of that series. — Editor.

DURING 1962 the Institute of Archaeology achieved its twenty-fifth anniversary. Founded in 1936 by Dr. Mortimer Wheeler with the invaluable support of his wife, the late Mrs. T. V. Wheeler, it was formally opened in St. John's Lodge, Regent's Park in April 1937. In an address at the opening, Sir Charles Peers, President of the Society of Antiquaries, defined its purpose: "If the essential character of this Institute be expressed in a word, it is a laboratory; a laboratory of archaeological science wherein the archaeologist of the future can learn his essential business. . . . In it the student shall find three things, materials for study, instruction in the treatment of antiquities, and training in archaeological method, in research and the recording of research."

When the Chancellor, the Earl of Athlone, declared the building open, the beginnings were slender. Several endowments enabled the building to be equipped and the Palestinian collection of Sir Flinders Petrie was the basic study collection lodged in the Institute. Sir Mortimer Wheeler was Honorary Director, and Dr. Kathleen Kenyon the Secretary. There was a practical workshop for the conservation of archaeological material, and Dr. Frederic Zeuner as Honorary Lecturer in Geochronology, commenced the Institute's studies in correlation of physical science with human history, which now forms one of its most important departments.

In the early years before the war lectures were given by foremost archaeologists, as well as practical courses. The outbreak of war closed down most of the activities, but in spite of considerable bomb damage the Institute was able to resume its functions as soon as hostilities ceased.

Sir Mortimer Wheeler resigned from Hon. Directorship on his appointment as the Director of Archaeology in India; he was succeeded by Prof. Gordon Childe from Edinburgh, who was also appointed to the University Chair of European Archaeology. Dr. Zeuner was appointed to a Professorial Chair of Geochronology in charge of his re-opened Department of Environmental Archaeology. On the practical side, the Conservation Department started up again, also the Photographic Department under Mr. M. B. Cookson, and a Librarian was appointed.

In 1946-1948, the aspects of the Institute's teaching were widened; a Department of Western Asiatic Archaeology was founded under the direction of Professor M. E. L. Mallowan; and an Indian Section under Professor Codrington was started jointly with the Institute and the School of Oriental and African Studies. In 1948 Professor R. E. M. Wheeler returned to take charge of the Archaeology of Roman Provinces; and Dr. Kenyon relinquished the Secretaryship to become lecturer in Palestinian

Archaeology. Dr. Cornwall was made assistant in the Department of Environmental Archaeology and Mrs. Maxwell Hyslop in the Western Asiatic Department.

In the succeeding years the staff increased to twenty-two. Professor Wheeler retired in 1955 and was succeeded by Mr. S. S. Frere. Professor Childe's term of office ended in 1958. At that point, the Directorship was divorced from the Chair of European Archaeology, and two appointments were made: Professor Grimes became Director and Professor John Evans was made Professor of Western European Archaeology.

The old house at St. John's Lodge was rapidly becoming insufficient to house the expanding activities of the Institute; and in 1958, the University was able to establish it in a new building on the north side of Gordon Square.

Five floors were allotted to the Institute. The Conservation Laboratories on the top floor are equipped with all the latest techniques and facilities for teaching and research, and can accommodate some twenty-four students. The two-year course includes instruction in applied chemistry, archaeological draughtsmanship, photography, early technology and museum recording systems, and is primarily intended for those who wish to make conservation of antiquities a career. A full course in Archaeological Photography can be followed in the large well equipped studio, and photographic work is also done by the staff.

On the fourth floor are the Prehistoric European, Roman and Indian Sections. On the third floor the Environmental Department has large laboratories for research, and teaching collections covering the environment of early man, his raw materials, osteology, soil and archaeological deposits, and European Lower Palaeolithic and the Stone Ages of other countries.

The Western Asiatic Department of the second floor contains the most important collections of the Institute. The Palestinian material particularly, constitutes the largest collection illustrative of this subject in the country, derived largely from Sir Flinders Petrie's excavations in Palestine. Smaller collections are representative of other sites, notably material from Professor Mallowan and Sir L. Woolley's excavations in Syria and Mesopotamia. Anatolia and Iranian sites are well represented. Tomb groups of the early Bronze Age as well as a chronological series, come from Cyprus.

The first floor houses the Library and Reading Room, which contains all the principal archaeological publications covering the fields of the Institute.

The teaching of the Institute is primarily organised for the Diplomas in Archaeology in the following subjects: Prehistoric Europe; Western Europe; The Iron Age and the Roman Provinces; Indian Archaeology; Mesopotamia; Palestine; Syria; Anatolia; Iran; Prehistoric Archaeology, including Environmental Archaeology; also for M.A., M.Sc., and Ph.D. Provision is also made for Research students for whom accommodation is available in a number of study rooms.

In the new surroundings, the Institute is more closely integrated to the University and reciprocal courses can be attended in other Institutions. Most members of the staff take part in excavations and field work; but the Institute does not itself organise expeditions. It is now also a centre for training and research for many students from the Commonwealth and other countries, who indeed form 30-40% of the student intake. Courses for the Extra-mural Diploma in Archaeology are also held in the Institute and during the session there are public lectures on all aspects of Archaeology.

NORTHERN NIGERIA 1962

By Edward A. Drew

AFRICA — "A land of scorching desert, inpenetrable jungle and fierce native warriors".

IT WAS difficult to be at all convinced by this standard image of the dark continent whilst drinking coffee to the sound of pop jazz in a supermarket coffee-bar, when this happened to be seven hundred miles inland from the dreaded "white man's grave" coast of the Gulf of Guinea. Of course, there are still vast tracts of Nigeria which are virtually as they were in the Stone Age, and seem doomed by their economic sterility to remain so. The native village, with its groups of grass-thatched mud huts, scattered amongst the fields of maize and millet, are still more the rule than the almost English sectors of towns such as Jos, on which the Expedition was based. And even here, the vultures busily scavenging the dusty streets and the persistent native vendors soon take away any illusions as to home.

We were primarily interested in the flora of the Jos Plateau area, but one cannot help being greatly moved by the continual contrasts afforded by so exotic a land — the palm trees rustling in the breeze from a passing Cadillac, the Nigerian in his latest-cut linen suit and the peasant woman virtually naked, the mud hut and the skyscraper office block. One must be continually amazed at the antiquity persisting amongst so much material progress.

In order to make the collection of plants for Kew Gardens and the British Museum, which was the main purpose of our expedition to Nigeria, we chose to work in an area of rugged hills, some thirty miles East of Jos. Here there was a suitable rest-hut situated on the main road from Jos to the next town (Bauchi) some fifty miles further on. The road, though excellent compared with the mud tracks elsewhere in the area, was considerably below the worst "B" Class to be found in the U.K. Despite this, our native drivers, loaned to us together with vehicles by the Forestry Department, frequently drove us into Jos at over seventy miles per hour — an experience both hazardous and exciting.

Once we began to move around in the Panshanu Hills, as this area was called, it was easy to see why progress has seldom penetrated beyond the railheads and principal towns. The terrain consisted of steep, boulder-strewn slopes, covered in straggling, thorny scrub, where every move anticipated slipping from a wet, slimy boulder into some deep cleft, or else being torn about by some unpleasant-looking bush or Euphorbia branch. Despite these obstacles to our progress, we covered a considerable area of this inselberg bloc in our four-week stay there, and produced an impressive quantity of dried plant material.

The term 'inselberg' refers to the origin of the Panshanu Hills. These are formed from an immense extrusion of granitic rock, hemispherical in shape, which has become split by earthquakes and weathered to the group of rocky hills and outcrops existing today. There are many similar areas of terrain in the Jos Plateau region.

In fact, the whole mass of the Plateau consists of a steep scarp face to the South and West, rising some 2,500 feet, and descending to the North and East by steps of about 500 feet, each step being a large area of savannah plains separated from the next by an area of similar rocky hills.

During our stay at Panshanu, we undertook a couple of long journeys into the surrounding bush. Dave Lawlor and myself spent five days traversing a mountain area some twenty miles South, called the Jarawa Hills, which rose to nearly 5,700 feet. This was the toughest country I have ever seen, and on the third day, we spent about ten hours covering less than five miles, followed on the next day by a descent of 2,500 feet down a slope densely covered by bamboo thicket. The trip had its lighter side too — especially when we arrived in the village of Maigemu, ten miles from the road. The village Emir insisted that we should pitch our tent *inside* his hut, and then presented us with an excellently cooked chicken. The hospitality of these people was most moving.

Meanwhile the other two members of the expedition, John Hall and Dick Newall, walked to the foot of a most picturesque group of hills on our eastern horizon from Panshanu. These were the Dass Hills, whose outline of towering pinnacles and sheer-sided valleys reminded us of a Walt Disney Toy-town. This trip necessitated a long trek across savannah-covered plains in scorching sunshine, punctuated with sharp torrential downpours, so characteristic of the weather of this area. In fact, for much of our stay it persistently rained every afternoon at either two or four o'clock, and so we took advantage of these shower-baths to wash the day's grime off; what is more, at the beginning of a shower, the water was quite warm, too. This procedure, I might add, greatly amused the villagers from the nearby village of Panshanu.

The local natives did not bother with us very much, except the official keeper of the resthut, who sold us eggs and corn on the cob, and some of the lads from the village whom we persuaded to catch lizards for us. These boys were very accurate with their catapults, and would do almost anything for an empty tin or two. We also attempted, in vain, to persuade them to catch us larger animals which were in the area, such as the rock hyrax (the closest living relative of the elephant and resembling a large scruffy rabbit) and also the porcupine, whose quills were abundant amongst the rocks. Dick actually disturbed one of these under a pile of leaves in a rock cleft — and it was impossible to decide which of them was the more surprised and moved away the faster.

There were also several troops of large dog-faced baboons and red Patas monkeys around the resthut area and in the hills. A Desert Lynx kitten had been found there, too, the previous year, and was the pet of a local mine operator's wife. We heard tales from him of leopards seen walking down the main road, but were not lucky enough to see one. All these animals, and many more from neighbouring areas, were to be seen in Jos Zoo, a fascinating place and so unexpected in such a remote township.

Although we had intended to remain at Panshanu for the full duration of our eight-week stay in Northern Nigeria, organisational difficulties and local advice caused us to reduce this to four weeks, and of the remainder of our time, we spent three weeks at the Forestry Department rest house in Naraguta, just outside Jos, and one week on the southern edge of the Plateau, near a village called Sha.

The first two weeks of the expedition had to be spent at Naraguta, since the arrival of our equipment from the coast was delayed, and we survived owing to the assistance from the Forestry Department, who were extremely helpful throughout the whole venture. Our thanks are mainly due to the Jos Forestry Officers, Ron Kemp and Mike Horwood, who arranged accommodation, transport, etc. throughout the time we were there, and also gave much encouragement to us.

The trip to the south of the Plateau, at the suggestion of Denis King (the local expert on orchids) was most fruitful from the botanical aspect, and it was also extremely interesting to see the local people, who are some of the most primitive in Nigeria. Cannibalism is authenticated here as recently as the 1940s so we were told, and the people go around virtually naked, despite the potential influences of several mining camps and the annual 'hordes' of tourists from the towns, only too eager to photograph a man wearing only the traditional penis-sheath or a native woman smoking a clay pipe.

When all our plants had been duly dried and despatched homewards, it was time for the long journey back to the coast to catch our plane home. This proved a most nerve-racking experience. The rainy season had caused the railway line from Jos to crumble in a slurry of red soil, and suddenly, during a peaceful last day of souvenir-collecting, we had to rush one hundred and fifty miles by road to Zaria at one hour's notice. With only a short time to catch the relief train, our driver averaged seventy miles per hour all the way over the mud road, and it was a good thing he was able to, since we were delayed for over an hour trying to by-pass a couple of bogged-down lorries. There were times on that frantic dash when I had visions of our aircraft arriving in England minus four passengers! To crown it all, as the train pulled out of Zaria station, Dave's wallet was stolen through the carriage window (including his passport) but rapid action on his part, — he was through that window in a flash — caught the culprit; but of course the train was delayed once again. However, all's well that ends well, and despite there being a further washed-out bridge to detour by road on the way to the coast, that DC-7 left Lagos airport with a full complement of passengers, four of whom did not wake again until the green fields of England appeared beneath the clouds.

Horn Sund 1962 .... Continued from page 19

The Govenor explained his early arrival by saying he was afraid that, with the continuing severe ice conditions, no more coal ships might get through the 30-mile mantle of ice to Longbearbyen; indeed he was quite anxious about the safety of his own ship, built for ice conditions. At Longyearbyen the "Ingerfem" was waiting to take us back to Tromsö, and after saying goodbye to the Governor we sailed for home reflecting on the wonderful weeks we had spent on his Islands.

At Bergen it was time to say farewell to Baranowski. It was a sad moment; for during the Summer we had advanced from complete strangers to great friends with life-long memories of a tremendous experience. We all owed a great deal to "Stan", as we knew him, for his guidance, his perpetually smiling face and his appreciation of our madder English customs. It is certain that without the tremendous hard work and enthusiasm of Stan and the other members, John Axtell, Dave Catcheside, Alan Husselbury, Chris Leaver, John Mitchell, Geoff Pert and "GG" Smith, the Expedition would not have achieved the success with which it is now credited.

CONTRIBUTORS

A few notes about our guest contributors:—

Sir Raymond Priestley is President of the Royal Geographical Society. He was a geologist on Shackleton's Antarctic Expedition (1907-9) and a member of the Northern Party on Scott's Last Expedition (1910-13). He was Vice-Chancellor of Melbourne University between 1935-38 and later Principal and Vice-Chancellor of Birmingham University (1938-52).

Colonel H. Pozner, M.C. is a Specialist in Psychiatry at the Queen Alexandra Military Hospital, Millbank. He was a student at University College Hospital, served in the Middle East during the 2nd World War and was sometime Assistant Professor of Psychiatry at the Royal Army Medical College. He is also a qualified parachutist.

Dr. C. S. Leithead is Lecturer in Tropical Medicine at the Liverpool School of Tropical Medicine and Consultant Physician in Tropical Diseases at Sefton General Hospital, Liverpool. He has studied heat illness at considerable length in the Middle East and to a lesser extent in British Guiana.

Mr. A. de Jong, Development Physicist, Horlicks Ltd, has been concerned with the development of emergency/survival rations in collaboration with medical officers of the Armed Services and of Polar sledging rations with Dr. H. E. Lewis of the Medical Research Council.

Miss Joan du Plat Taylor is Librarian at the Institute of Archaeology, University of London. She is particularly interested in submarine archaeology and was closely associated with the excavation of a Bronze Age wreck off Cape Gelidonya in 1959. She was co-director of the work at Motya last summer.

Charles Morris was President of the Cambridge University Explorers' and Travellers' Club last year and is now working with I.C.I. Ltd.

THE Society gratefully acknowledges the receipt of the following publications:

Visa (Journal of the Cambridge University Explorers' and Travellers' Club).

Rivista Mensile (Journal of the Italian Alpine Club).

Polish Geographical Review (Polish Academy of Sciences, Warsaw).

Polar Notes (Stefansson Collection, Baker Library, Dartmouth College, U.S.A.)

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