Photographed at lunch on Tuesday, 25th November, at the C.S.I.R.'s recreation site are, from left to right, Mr. D. Vaclavik, a Czechoslovakian, who is a geologist, and who, with three other expedition members, will spend most of his time at the newly established Borga Base (see following article); Mr. Marten du Preez, a former leader and chairman of the Antarctic Association who, in 1966, was awarded the Antarctic Medal (Antarktiese Bulletin, *No. 16, July, 1966); Mr. W. J. van Zyl from the communications section of the Department of Transport, a former expedition member and leader of SANAE 11; and Mr. Dirk Neethling, a member of a former expedition, an Antarctic Medal holder* (Antarktiese Bulletin, *No. 26, July to December, 1968*) *and director of the South African earth sciences programme in Antarctica.* (*Photo*—Council for Scientific and Industrial Research).

UNIQUE OPPORTUNITIES FOR PROBING THE EFFECTS OF COLD AND ISOLATION ON MAN AND ANIMAL LIFE

An Antarctic expedition provides a unique opportunity for carrying out research in medicine, physiology and psychology. The effects of cold on animals and man have been studied since ancient times. Observations were made by Aristotle and Hippocrates. Towards the end of the nineteenth century the atmospheric gases were liquified and the effects of very low temperatures on a wide variety of micro-organisms, cells and tissues of higher animals were studied. The experiences of frostbite in Antarctica led to intensive studies of the effects of temperatures in the range occurring in nature.

In addition to research associated with the Antarctic climate and environment, studies can be made of groups isolated from all other human contact for a prolonged period. Each group has a uniform diet, lives under regular physical conditions where there is relatively uniform climate indoors, and out-of-doors exposure to cold is intermittent. Important work can be carried out on such a group, free from all outside influences, especially in the physiological and psychological fields of medicine. The length of the period over which studies can be made, viz. a year, means that results are far more truly representative than those obtained from short-term experiments elsewhere. It was as a result of experiences of scientists in the Antarctic that led to the study in the laboratory of the effects of cold on many forms of life.

By 1940 it was established that minute organisms that survived dessication (drying out) under natural or experimental conditions, would also survive freezing at any temperature between 0°C and —269°C. At temperatures below —100°C, biochemical changes were either arrested or slowed to such an extent that storage for indefinitely long periods was possible, and certain viruses and pathogenic bacteria were indeed banked in this way.

Studies on higher animals, however, soon showed that cold-blooded animals, such as frogs and fish, would not stand freezing at temperatures below about —1°C, while warm-blooded animals, including birds and

mammals, would not recover if cooled beyond a limit characteristic for each species between 15°C and 28°C, because breathing and heart beats ceased. Some hibernating animals, however, are able to withstand their bodies being cooled down to temperatures of 5°C to 10°C. The only mammalion cells that withstood freezing *in vitro* were human spermatozoa, skin cells and certain tumour cells.

In 1949 the whole outlook was changed by the chance discovery that glycerol would protect the spermatozoa of birds and mammals against cold for long periods. Red blood cells can be banked in the same way and subsequently used for transfusion, provided that the glycerol is removed after thawing and before blood is introduced into the blood stream. Between 1949 and 1959 a wide variety of living cell tissues were banked at very low temperatures in media containing glycerol without loss of viability.

A wide variety of other substances also seem to protect living matter stored in this way. Of these the least toxic and most effective is dimethyl sulphoxide. This agent has made it possible to bank the human cornea at very low temperatures for subsequent transplantation. The major problem today is to bank whole organs, such as the kidney and heart at low temperatures. For this it is necessary to fill the vascular channels of these organs with increasing concentrations of the protective agents during cooling to very low temperatures.

The Antarctic is the ideal source of material to aid scientists in their study of the effect of extreme cold on living organisms. The importance of a co-ordinated international programme in which all SCAR nations participate is that by making the same tests simultaneously in various parts of Antarctica, comparisons can be made of variations occurring in different areas. This is particularly true in the case of reaction of subjects in an experimental group, which can be compared with those of others of different nations accustomed to different climates and living conditions in their own country.

A medical research programme was drawn up by the Biology Working Group of SCAR, which all participating nations were asked to adopt. South Africa's contribution to this programme is supervised by the Human Sciences Laboratory of the Chamber of Mines. The programme includes a study of the environmental conditions to which members of Antarctic expeditions and bases are exposed, together with as detailed a study as possible of their physical activities, the clothing worn, sleep periods and other relevant data. (See *Bulletin* No. 27, 1969, for extracts of some of the results published).

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

(The preceding article has been reprinted from *Archimedes*, Vol. 11, No. 3, August, 1969, by kind permission of the publishers, The Foundation for Education, Science and Technology).

KAART VAN OMGEWING TE SANAE

Die Staatsdrukker het goedgunstelik toestemming verleen om die nuutste kaart van Queen Maud Land, Antarktika om en by SANAE in die *Bulletin* te reproduseer. Kennisgewing van sy vergunning verskyn onderaan die kaart wat bladsye 62 en 63 in beslag neem. Dié kaart sal ons lesers daartoe in staat stel om die gebeure by SANAE beter te volg.

Een van die belangrikste veranderings aan die ysfront van Antarktika in die afgelope 5 jaar, die wegbreek van bykans twee-derdes van die Trolltunga (Sien „Earth Science Programme, S.A.N.A.E. 1969-1970" in hierdie uitgawe) word duidelik aangedui. Hierdie gebeurtenis kan verrykende gevolge hê op die aflaai van voorrade by SANAE.

Ons wys belangstellende lesers dat die sketskaart (T.S.O. Misc. 4382) by die Direkteur, Driehoeksmeting, Posbus 624, Pretoria in 'n groter formaat, geskik vir muurkaarte in skole ens., beskikbaar is.