

Sir Victor Negus has dedicated his excellent *History of the Hunterian Trustees* to the memory of John Hunter. It shows how the Trustees have well maintained the purpose of the collection to teach scientific surgery to undergraduates and postgraduate students. Hunter brought an observant scientific mind into the study and practice of surgery and in the Hunterian Museum this abides to-day.

ANTARCTICA

Antarctica

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EVEN a cursory acquaintance with conditions in Antarctica is sufficient to enable one to understand why it has stimulated the interests of explorers and, more recently, of earth scientists even if, to date, its economic importance is represented only by a declining whaling industry. For those who approach the Antarctic via the South Atlantic, the first view of a typical landscape is South Georgia, a mountainous island with extensive glaciers and a fringe of vegetation consisting of lichens and coarse grasses. The fact that it is, nevertheless, at the same latitude as Sheffield emphasizes the contrast between the southern and northern hemispheres: that civilized life can exist in northern Europe at latitudes which involve considerable survival problems in the southern hemisphere.

Less than one-tenth of 1 per cent of the fourteen million square kilometres of continental Antarctica is free from the ice which averages 2 km in depth over the continent as a whole. The removal of this ice would raise the level of the oceans by 60 m, while the land surface of the continent would rise by some 600 m through isostatic compensation. Nevertheless, Antarctica is an arid region with a precipitation of only 12–15 cm equiv. of water per year. This, however, is sufficient to account for the vast tabular icebergs which break away from the perimeter of the continental ice shelf. Antarctica also has its oases, like Lake Vanda with a permanent ice cover 4 m thick and yet with a temperature of 26° C at its bottom. Is there net accumulation of ice over the continent? What is the explanation for the thermal balance in the 'oases'? Almost every statistic about Antarctica raises questions to which answers are still being sought.

Antarctic research is carried on by some twelve nations and, although the primary scientific reason is the extension of man's knowledge of his global environment, there are respects in which it may contribute to his more immediate well-being. The extension of meteorological observations is relevant to weather prediction throughout a vast area of the hemisphere while ionospheric data are important in connexion with radio communications, which are especially difficult in polar regions (due to auroral and associated phenomena).

The heroic era of Antarctic exploration which commenced with Captain James Cook's circumnavigation in 1772–75 finally gave way to intensive scientific investigation, with the final great journey in 1957–58 of Fuchs and Hilary coinciding with the International Geophysical Year which brought into being a vast international scientific programme. This has largely been maintained and, indeed, has been extended during the International Years of the Quiet Sun of 1964–65. Intensive land-based scientific work on any scale is very recent indeed and may be said to date from the creation, in 1943, of the Falkland Islands Dependencies Survey with the establishment of a number of stations in the Antarctic Peninsula (formerly Graham Land) and the initiation of a detailed survey, regular weather observations, etc.

The present volume, entitled *Antarctica*, is edited by Trevor Hatherton on behalf of the New Zealand Antarctic Society. Hatherton was New Zealand's chief scientist for

the Antarctic during the International Geophysical Year and his twenty-two contributors are drawn from the United States, New Zealand and the United Kingdom. The subject-matter is divided into four main parts: the nations in Antarctica; the southern ocean; the antarctic continent; the south polar atmosphere. Each author is a specialist in his field and to some extent this is a book for specialists. On the other hand, it is characteristic of Antarctic research that few who embark on it can avoid developing wider interests outside their own speciality. The present volume will therefore help the individual to acquaint himself with what his colleagues in other scientific disciplines are doing and enable him to set his own work in a wider context.

With so many contributions it is unfortunately possible only to make a selective review.

The first chapter offers a historical survey of national interests and activity in Antarctica from its discovery until the Antarctic Treaty. Some may regard this latter as the most important outcome of the International Geophysical Year, representing a political reconciliation of competing territorial claims in which the U.S.S.R. and the United States joined in taking a leading part. The Treaty is quoted in full in an appendix and it is, perhaps, worth recalling here the following extracts:

"... Recognising that it is in the interest of all mankind that Antarctica shall continue forever to be used exclusively for peaceful purposes and shall not become the scene or object of international discord; . . . There shall be prohibited, *inter alia*, any measures of a military nature. . . Freedom of scientific investigation in Antarctica and co-operation toward that end, as applied during the International Geophysical Year, shall continue, . . ."

Chapters 2 and 3 deal with "Techniques of Living, Transport and Communication" and with "The Mapping of Antarctica" respectively. While the advent of the aeroplane together with the tellurometer has revolutionized mapping, it is nevertheless true that dogs are in many cases still the safest and often the only suitable means of transport. Living has its own problems, especially when men must live underground like rabbits while maintaining apparatus for scientific observations above the surface.

Chapters 4–7 deal with oceanic Antarctica, the movements of both water and ice pack, the ocean floor, the fauna and the abundant higher species of birds and mammals. The section on the continent, Chapters 8–14, discusses the physical characteristics and dynamics of production and wastage of the Antarctic ice, the distribution of land below the ice and its geology, as well as the flora and fauna.

The final section (Chapters 15–18) is concerned with the south polar atmosphere, its meteorology, the upper atmosphere and ionosphere, and the polar geomagnetic field and its fluctuations. The Aurora Australis, like its associated Boreal phenomenon, occurs most frequently in a zone within the polar region and is allocated a special chapter (Chapter 16). The aurora is closely associated with geomagnetic disturbance produced by electric currents flowing in the auroral regions, and it is interesting to note that it was this connexion that led C. F. Gauss to speculate so long ago as 1839 on the existence of an electrically conducting upper atmosphere. We now know that a primary mechanism in auroral production is the precipitation, down magnetic lines of force, of energetic electrons and protons. Thus one important aspect of Antarctic auroral research is concerned with studies conducted simultaneously in both hemispheres from stations which are connected by the same geomagnetic field line. Gauss spoke of the "enigmatic phenomena of the Polar Aurora"; after a lapse of more than a century it still has its mysteries to be resolved.

Antarctica is, technically and scientifically, a volume of considerable merit and is provided with an up-to-date map (scale 1:16,000,000) on which are indicated the locations of the various scientific bases. T. R. KAISER