to our disappointment disappeared behind East-Cape, without returning a call.

The *R.S.A.*'s every move has been watched very carefully and morale is running very high for now we are certain that we are next on the list.

Two kittens have made themselves part of the family and many hours that would have otherwise been dull have been brightened by their presence.

Packing and cleaning around the base has begun with great zest and everyone is looking forward to the arrival of our relief team.

Gough Newsletter for February 1971

This month we experienced for the first time the type of weather which we expected to have on Gough. During the first few months, the weather reminded us very much of the Cape weather. Considerable rainfalls have been experienced and the days were colder than the previous months.

Our new system of weekly cooking and household duties seems to make the time go by a lot quicker.

Weightlifting is popular and hard work is done with homemade weights. Peet Ludwick, our medical orderly, celebrated his 21st birthday on the 13th of this month. A number of cakes were baked for the occasion and in the evening we had an enjoyable 'braaivleis' with 'mieliepap' which would have made any Transvaler's mouth water.

We are all looking forward to the *RSA*'s arrival at the end of April. A PWD work-party will be paying a visit and of course, parcels from home will be expected. Snooker and photography remain very popular and snooker competitions are often held. Plenty of fish and crayfish were caught during the month and tastily prepared.

(*Die Nuusbriewe is goedgunstelik deur Die Departement van Vervoer aan die* Bulletin *voorsien.*)

SCIENCE

THE IONOSPHERE

Part 1 – What is the Ionosphere?

This article is the first of three parts which deal with the ionosphere and research in this field at Sanae. Here we hope to give the reader a brief idea of what the ionosphere is and why it is studied. In the next issue the importance of Sanae as an ionosphere observatory will be discussed and some of the interesting results arising from the ionosphere programme will be described in the subsequent issue.

High frequency radio waves still play a major part in long-distance communications despite recent developments in satellite technology and intercontinental cables that have vastly improved the quality, capacity and reliability of communication systems. High frequency radio waves are transmitted around the earth by reflections from the earth's surface and from the ionosphere – the 'radio mirror' above the earth's surface where there is sufficient ionization to return radio signals to earth. This part of the atmosphere, starting about 50 km above the earth, where the air is ionized by ultra violet rays and other effects from the sun and where reflection of radio waves takes place, is made up of a number of different bands or layers marked by special properties. The basis of the division into layers is the variation in electron density from one level to another.

The D-region (40 to 90 km above the earth) is very weakly ionized, but because of the relatively high density of the neutral gas and the high collision frequency of electrons in this region, a great deal of energy can be removed from a radio wave passing through the region.

The E-region lies between about 90 and 130 km. Above this are the F1 and F2 layers from about 130 up to 170 km and 170 km upwards, respectively. The E, F1 and F2 layers reflect radio waves typically used in communications.

First indications of the existence of the ionosphere appeared in 1901 when Marconi succeeded in sending wireless signals from Cornwall to Newfoundland. This resulted in considerable speculation as to the mode of propagation of the waves around the curved surface of the Atlantic. Calculations showed that diffraction (suggested initially) was quite inadequate to explain the observed bending of the waves. In 1902, Kennelly in America and Heaviside in England almost simultaneously postulated the existence of a conducting layer in the upper regions of the earth's atmosphere and suggested that this layer might reflect radio waves and force them to follow the curvative of the earth.

The ionosphere is generally probed from the ground using an ionosonde – essentially a radar instrument which automatically records the heights of reflections of pulses from the ionosphere while sweeping through the high frequency band of radio waves. Some other methods of probing the ionosphere are depicted in the figure.

One of the reasons why ionospheric research at Sanae is important is because observing stations are relatively scarce in the southern hemisphere. The large areas covered by the Indian and South Atlantic oceans are unmonitored. Such gaps could lead to major errors in the world maps of ionospheric characteristics, with serious results for high frequency radio communication. Theoretical calculations indicate that these maps are, in fact, misleading in some regions. Further reasons for the importance of Sanae as an ionosphere station will be discussed in the next issue.