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THE PROGRESS OF THE SEA-WATER INVESTIGATIONS

by

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Since last reported, in 1961 considerable progress has been made in our investigations. The collection of samples of sea water is now substantially complete. There are still a few areas where additional samples, particularly deep samples, would be welcome, and we would again like to appeal to anyone who can conveniently collect samples for us from these areas to let us know in advance, so that we can provide the bottles and instructions. The areas concerned are:-

- 1) The North Pacific between 10°N and 40°N;
- 2) The South Atlantic between the equator and 50°S;
- 3) The North Polar Basin;
- 4) We would like deep samples from any deep trenches (say below 7000 metres) and near-bottom samples from any fairly deep isolated basins, where it is likely that the water is seldom disturbed.

The conductivity and chlorinity determinations have been completed on almost all the samples. They continue to show the same trends as previously reported. When conductivity is plotted against chlorinity the points show a considerable scatter, which is much the same throughout the salinity range 30-42‰. There is a definite statistical tendency for surface samples to be low in conductivity and deep samples high, although there are many exceptions.

Density measurements have been made on a selected range of samples. Density plotted against conductivity gives a very good straight line. Density plotted against chlorinity gives about ten times as much scatter.

These variations between samples are interpreted as signifying variations in the relative proportions of the ions in the water. Dr. Riley, at Liverpool and his assistants, have completed chlorinity and sulphate determinations on most of the samples; they have been unable to detect any significant variations in the sulphate: chloride ratio. No other acid ions represent a sufficient proportion of the total to significantly affect the density, so it seems definite that the variations must be in the metal ions.

Dr. Culkin has continued his investigations into the determination of the metals. The major difficulties are centred on the calcium; this is unfortunate, as the calcium seems likely to be the controlling factor in the variations. Separations with ion-exchange resins are not very satisfactory, as they are slow and the precision is hardly adequate. We are at present investigating the use of a flame spectrophotometer, and this technique seems extremely promising. We think it will provide the answer to determinations of calcium and strontium, and perhaps potassium.

The new absolute-density apparatus should be in service during October. It is hoped it will be possible to attain a precision of at least 1 in 10⁶, corresponding to the third decimal place in sigma-T, and this in combination with the present relative density values will provide the data for computing relationships between sigma-0 and conductivity and chlorinity. The absolute-conductivity apparatus has been delayed and will now probably not be finished until next year.

The results, and their implications, were studied by the joint panel convened by UNESCO as recommended by the Hydrographical Committee last year. Dr. Hermann and myself represented ICES on this panel, which elected Professor Dietrich chairman. The first report of the panel will be presented to the Committee, for discussion and comment.

A side-line from the main purposes of the investigation is the determinations of fluoride by Dr. Riley and his colleagues. A report on this work will appear shortly (Greenhalgh & Riley, Nature, in press).