THE CHEMISTRY OF THE ALBUMINS.

THE composition and constitution of the albumins have hitherto been studied almost exclusively from the analytical point of view, and particularly by the examination of the products of hydrolysis effected by either acids, alkalies, enzymes, or putrefactive bacteria.

Improved methods for the separation of these products, due to Kossel, E. Fischer, and others, have led to the conception of the complex albumin molecule as composed of a large number of simple molecules, consisting to a great extent of monamino- and diamino-acids and related compounds (compare NATURE, vol. lxv. p. 90), united together by some form of condensation, which involves an amino-group, and is probably similar in nature to that which occurs in the formation of the acid amides.

The various members of the vast group of albuminous substances may differ from one another in many ways, but two of the chief points of difference appear to be the variety of these component groups, and the numbers of them contained in a single molecule. Thus a comparatively simple albuminoid substance, such as silk when it is completely hydrolysed, yields, among other products, the monamino-acids, tyrosine, phenylalanine, leucine, alanine (amino-propionic acid), and glycine (aminoacetic acid). Gelatin, on the other hand, which is also comparatively simple in composition, differs markedly from silk by the absence of tyrosine, whilst oxyhæmoglobin, to take another instance, yields tyrosine, but no glycine.

By the incomplete hydrolysis of the fibroin of silk, moreover, Prof. E. Fischer has obtained a substance which appears to be a compound of aminoacetic and amino-propionic acids. The formation of this substance is of great interest, since it probably represents an intermediate stage of the decomposition, and affords strong confirmation of the view of the constitution of the proteid molecule which has just been stated.

Most of the final products of hydrolysis of the albumins are familiar compounds which can readily be prepared by synthetic methods, but very little has hitherto been known of the more complex substances to be obtained by the linking together of several of these molecules. It is in this direction that Prof. Emil Fischer has been working for some time past, and he has contributed to the current number of the *Berichte* an account of the highly important results which have already been attained. The plan of attack consists in endeavouring to build up complex substances from the simple amino-acids by first introducing a second molecule of the same or another acid, and then repeating the process as frequently as possible with each successive product.

The first step was taken some time ago by the production of glycylglycine, $NH_2.CH_2.CO.NH.CH_2.CO_2H$, from glycine anhydride. This substance contains two molecules of glycine united in the typical manner, and is the simplest of the *polypeptides*, as these bodies have been named, because of their assumed similarity to the peptones in structure. To add a third link to the chain is, however, a matter of difficulty, owing to the ease with which the amino-group undergoes change. Two methods have, however, been found by means of which this can be accomplished.

The first of these consists in building up the new amino-acetic molecule by first introducing into the amino-group the chloracetyl radical, $Cl.CH_2.CO.$ (by the action of chloracetyl chloride), and then introducing the amino-group by the action of ammonia, the final product being a crystalline substance having the formula of a diglycylglycine, $NH_2.CH_2.CO.NH.CH_2.CO.NH.CH_2.CO_2H$. A description of the properties and reactions of this substance has, unfortunately, not yet been published.

The other method consists in first of all introducing the group $.CO_2C_2H_5$ into the amino-group of glycylglycine. The resulting compound can then be converted into an acid chloride, which readily reacts with the ester of glycine to form the desired compound containing three glycine molecules. A repetition of this process leads to the addition of a fourth glycine molecule to the chain, the final product which has hitherto been obtained being of the respectable complexity shown by the formula

$$CO_2C_2H_5.NH.CH_2.CO.NH.CH_2.CO.NH.CH_2.CO.NH.CH_2.CO_2C_2H_5$$

(carboxethyl-triglycylglycine ester). This substance is crystalline and is converted by ammonia into a crystalline amide, which gives, with an alkali and a copper salt, the well-known biuret reaction, which is given by all the amides of this series, as well as by the albumins. The group $.CO_2C_2H_5$ combined with the amino-group cannot, so far, be removed from the molecule, so that, until some means of doing this is discovered, this method can scarcely be expected to yield derivatives so closely related to the actual proteids as those obtained by the method first described.

Both methods obviously lend themselves to the production of a great variety of compounds containing different amino-acid groups, and substances of this kind, derived from glycine and leucine, and from glycine and alanine, have already been prepared. It seems probable that by their extended use compounds of the order of complexity of the peptones or albumoses may soon be prepared. The application of both methods is, indeed, still in its infancy, but we can have little doubt that the genius which laid bare the innermost secrets of the sugars will succeed in solving many of the problems which surround the chemistry of the albumins.

ARTHUR HARDEN.

THE ANTARCTIC EXPEDITIONS.

THE report of Captain Scott to the presidents of the Royal and Royal Geographical Societies, which is printed in the July number of the *Geographical Journal*, adds a number of points of geographical interest to those previously published, especially with regard to the great southern ice-barrier, and the nature of the lands discovered by the British expedition; while the map published at the same time, which has had the advantage of revision by Lieut. Shackleton since that officer's arrival, permits the details of the narrative to be followed with much clearness, although it is still to be considered merely provisional.

The voyage down the east coast of Victoria Land brought to light some new features in the configuration of the country. Thus, in about lat. 75° 30′, an enormous floe of the inland-ice was seen to descend into the sea and extend for many miles to seaward, closely resembling the Great Barrier and the barrier formation which entirely fills Lady Newnes Bay. Near the entrance to MacMurdo Strait (between Erebus and Terror Island and the mainland), ice-cliffs, 150 feet high, were again skirted, being evidently the seaward face of the great glacier subsequently explored by Lieut. Armitage. During the voyage eastward along the face of the Great Barrier, soundings for some time showed depths of more than 300 fathoms, the barrier edge being very irregular, and varying from 30 to 215 feet in height. In the neighbourhood of the eastern land discovered by the expedition (King Edward VII. Land) the soundings suddenly became less, varying from 70 to 100 fathoms. The bare patches seen among the snow slopes of the new land, which are evidently the sharp spurs of snow-capped hills, stand at a height of 2000 to 3000 feet. The balloon ascent and sledge expedition made in long. 196° 15′, showed that the surface of the barrier[1] undulated in long waves running W.S.W. and E.N.E. It was noticed that here the ship neither rose nor fell in relation to the ice, thus apparently indicating that the latter is floating.

The winter quarters were established in February, and the magnetic observatory was in readiness for the term-day observations of March 1, all the subsequent term days being kept by Mr. Bernacchi without a break. On May 3 a strong southerly gale brought the first heavy snowfall, also blowing the strait clear of ice to within 200 yards of the ship. Mr. Hodgson was constantly engaged on his biological work, keeping holes open for his nets and fish-traps, and all the officers assisted Lieut. Royds in the night meteorological observations. Auroral displays were infrequent and feeble, but were carefully observed. The winter sledge reconnaissances revealed much of the topography of the neighbourhood, both on the south side of Erebus and Terror Island, and between it and the mainland, where there are three smaller islands, named White,

1 The whole southern ice-sheet is spoken of throughout as the "barrier," though this term would more naturally apply to its northern face only.