INTRODUCTORY: CELLS AND TISSUES

or of like order. The peptones and albumoses afford a still further series of degradation products, the group of the **amino-acids**, which together make up about three-fourths of the albumin molecule. These amino-acids are first cousins of the fatty acids, are indeed fatty acids with qualities tending to be basic by the addition of NH₂ molecules; which again by hydration or by the addition of an OH molecule become the hydroxyl fatty acids. These amino-acids, always present as degradation products of protein, are in reality the basis of proteins; the protein is built up by a linking together of numerous amino-acid molecules.

Chemists have now been able to obtain pure, and to study, a series of these amino-acids, and have been able to obtain optically active forms of them, the significance of which fact will appear. It had been noted for a long period that if a substance were the product of vital processes, it was optically active, but if it were synthetically produced by the chemist, it was optically inactive. The optical activity of the new synthesized amino-acids indicates that they are, so far as human observation can go, absolutely identical with the amino-acids of the body.

The amino-acids are amphoteric, that is, they possess both acid and basic properties, acid by reason of their COOH group and basic by the NH₂ groups, and it is this duality of affinity that permits linkage. To use a homely simile, let us imagine the place of an amino-acid taken by a man, with two artificial arms; at the end of one is a hook (the basic affinity), at the end of the other, a ring (the acid affinity); if there were a large number of such men they could form a complete circle, hook in ring, hook in ring throughout the entire group. If, now, we imagine the children of each man hanging on to his coat tails, we have a large colony (the compound molecule) depending for perfect cohesion upon the hook and ring men. These rings of varying number of amino-acids are the polypeptids, and a linkage of eighteen individuals has been experimentally obtained. It is not even necessary that the links should be the same amino-acids, just as it is not necessary that the men be of the same race. These synthetic compounds prove by their character to be all but identical, if not identical with the peptones of the body.

The conception we have here given may be erroneous in particulars, but we have attempted to give the idea that the complete molecule is a ring, and that ring we have suggested by the bizarre simile of the group of men hand in hand or "ring in hook." This, be it remembered, indicates only the simpler molecule; the more intricate proteins, polymerized forms, are aggregations of such rings, and it will readily be seen that a very slight change in the individuality of one sub-group will change the composition of the whole. Reverting to the group of men with the children hanging on to their coat tails, we have to picture these groups as being surrounded by a concourse of individuals, who are constantly moving to and fro; such a picture, for example, as a bird's-eye view of a fair ground would afford; these individuals