the advance of all. In the realm of thought we gain by giving, and the more lavish our offerings, the richer we become.

We glory in the achievements of chemistry, and we find merit also in its imperfections, for they give us something more to do. Never can the work be finished; never can all its possibilities be known. Hitherto the science has grown slowly and irregularly, testing its strength from step to step, and securing a sure foothold in the world. Now comes the time for better things: for system, for organization, for transforming the art of investigation itself into something like a science. The endowment of research is near at hand, and the results of it will exceed our most sanguine anticipations.

A TYPE OF REACTION BY WHICH SODIUM CARBONATE AND HYDROCHLORIC ACID MAY BE FORMED IN THE ANIMAL ORGANISM.

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IN a preceding paper[1] I have called attention to the basic properties of protein substances and have shown that preparations of the crystalline globulin edestin, as usually obtained from the hemp seed, are mixtures of salts, chiefly chlorides and sulphates. The nature of this combined acid depends upon the salts present in the solution at the time of precipitation, the acid of the seed sufficing to enable some of each of the acids of these salts to combine with the protein.

These facts led me to examine the precipitate produced by carbonic acid, in a dilute sodium chloride solution of edestin, as it seemed possible that this might consist chiefly of chloride.

A quantity of a relatively pure preparation of edestin, which had been several times recrystallized from a warm dilute sodium chloride solution by cooling, was suspended in water and made exactly neutral to phenolphthalein by decinormal potassium hydroxide solution. The edestin thus neutralized was washed with water and dissolved in sodium chloride brine. The solution was diluted with water until it became slightly turbid and carbonic acid gas was passed through it until the edestin appeared to be completely precipitated. This was filtered out, washed thoroughly with 1 per cent. sodium chloride solution

[1] This Journal, **24**, 39.

and then with 50 per cent. alcohol, until no chlorine could be detected in the washings, dehydrated with absolute alcohol and dried over sulphuric acid. The substance thus prepared, while insoluble in dilute sodium chloride solution, was largely soluble in pure water, as well as in strong sodium chloride brine, yielding solutions acid to litmus and to phenolphthalein; to neutralize 1 gram to the latter indicator, 1.9 cc. of decinormal potassium hydroxide solution was required. Fifteen grams of this preparation were treated with freshly boiled water and 28.5 cc. of decinormal potassium hydroxide solution, diluted with much water, were added. The edestin, which separated completely from the solution, was then filtered out, washed with water and the filtrate and washings evaporated on a water-bath. The residue was dried at 110° and analyzed with the following results:

	Gram.
Organic matter	0.0222
Inorganic matter	0.2123
Total residue	0.2345

The inorganic residue contained:

	Gram.
Potassium chloride	0.1994
Potassium sulphate	0.0153

The potassium added was equivalent to 0.2127 gram of potassium chloride, so that over 93 per cent. of the potassium added was recovered as chloride. From this analysis we find that with 1.5 grams of edestin, equal to 13.5 grams dried at 110°, 0.0976 gram of hydrochloric acid or 0.072 per cent. of the protein had been precipitated. Corresponding to this quantity of hydrochloric acid, 0.1417 gram of sodium carbonate must have been produced in the salt solution by the carbonic acid. It seems probable that by a similar reaction both sodium carbonate and hydrochloric acid may be formed from sodium chloride in the organism, since there is always sodium chloride and protein matter present where carbonic acid is produced in the tissues.[1]

[1] Cf. Schulz: Pflüger's *Archiv.*, **27**, 454.

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