It is well known that denatured proteins react very readily with hæms to form hæmochromogens; indeed, this reaction is a very sensitive test for denaturation occurring in the course of purification of native proteins. Yet the individual constituents of proteins, the amino-acids, with the exception of glycine⁷ and histidine⁸, are generally believed not to react with hæm. However, it has now been found that, under suitable experimental conditions, most amino-acids do react with hæm to form typical hæmochromogens, showing only slight differences in the positions of their absorption bands. In the course of these reactions, the absorption bands of dihydroxyl-hæm appear first and are then gradually replaced by those of the amino-acid hæmochromogen. Since urohæm is much more soluble than protohæm, it reacts more easily with amino-acids, especially with histidine, lysine, arginine and glycine, which give good hæmochromogens in 1 per cent sodium carbonate without passing through the intermediary stage of dihydroxyl-urohæm. As the reaction of urohæm with other amino-acids requires the presence of sodium hydroxide, the formation of hæmochromogen is, in these cases, preceded by that of dihydroxyl-urohæm. Of the two dicarboxylic amino-acids, only glutamic acid reacted with urohæm; but neither glutamic nor aspartic acid reacted with protohæm, although tested under a great variety of conditions. A spectrophotometric study of the reactions of protohæm with histidine, lysine and glycine showed that two molecules of each amino-acid were required per molecule of protohæm to form the corresponding hæmochromogen. The dissociation constants (K) at 20° C. were found to be 3.4×10^{-3} for glycine-, 1.98×10^{-3} for lysine- and 9.27×10^{-4} for histidine-hæmochromogen.

These results suggest that in the formation of hæmochromogens by denatured proteins such as globin, it is not only the imidazole groups which take part in the reaction, but also probably the free amino-groups as well. In fact, it is known that whereas a molecule of free native globin will combine with only four molecules of hæmatin or hæm to form methæmoglobin or hæmoglobin respectively, denatured globin combines with as many as twenty-four hæms to form globin hæmochromogen^{7,9,10}. Since in a hæmochromogen the iron atom (Fe^{++}) of each hæm combines with two nitrogenous groups, the saturation of a globin molecule with twenty-four hæms implies the presence in the globin molecule of a minimum of forty-eight hæmochromogen-forming groups. Amino-acid analysis of horse globin has shown that the molecule contains eighty-eight basic amino-acid residues^{11,12} (including thirty-six molecules of histidine) and six terminal NH_2 -groups¹³, which may be regarded as providing a total of ninety-four potential hæmochromogen-forming groups. Thus the molecular ratio of these groups to hæm was 94:24 or about 4:1, half of the groups reacting with hæm. On the other hand, in the case of a free amino-acid such as glycine, histidine or lysine, the molecular ratio of amino-acid to hæm must be about 1,000:1 for complete hæmochromogen formation. This clearly indicates that the affinity of hæm for free $-\text{NH}_2$ -groups in a protein molecule is much greater than its affinity for these groups in individual amino-acids.

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Note added in proof.—A complete account of the reactions of hæms with cyanide, isocyanide and sodium hydroxide has been given elsewhere^{14,15}.

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Anhydro-N-Carboxy-DL- β -Phenylalanine

IN view of the increasing importance of anhydro-N-carboxyamino-acids for the synthesis of polypeptides^{1,2}, it is pertinent to report the following simple preparation of compounds of this type.

For example, DL- β -phenylalanine was heated under reflux with a solution of phosgene in toluene (10 per cent w/w) until dissolved, when anhydro-N-carboxy-DL- β -phenylalanine (I) separated in 70 per cent yield on cooling; it melted at 128–129° to a clear liquid which decomposed vigorously at about 155°. This is clearly more convenient than the procedures employed heretofore^{3,4}.

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Synthesis of 1:1:1 Trifluoropropyne

THE simple fluorocarbon radicals $\text{CF}_3\cdot$ and $\text{CF}_3\text{CF}_2\cdot$ are obtained by the irradiation of the compounds iodotrifluoromethane and iodopentafluoroethane respectively. These radicals will initiate the polymerization of olefines, and iodotrifluoromethane with ethylene, for example, yields a polymer of general formula $\text{CF}_3\cdot[\text{CH}_2\cdot\text{CH}_2]_n\cdot\text{I}$ (where $n = 1, 2, 3$ and 4). With tetrafluoroethylene, longer chain iodo-fluorocarbons $\text{CF}_3\cdot[\text{CF}_2\cdot\text{CF}_2]_n\cdot\text{I}$ ($n = 1-15$) are obtained, and these in turn yield long-chain fluorocarbon radicals, $\text{CF}_3(\text{CF}_2)_n\text{CF}_2\cdot$, when heated or irradiated¹.

The reaction between iodotrifluoromethane and acetylene has now been investigated. A smooth reaction occurred under the influence of ultra-violet light or heat, and the compound 3-iodo 1:1:1-tri-