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PLASTID PIGMENTS

WITH SPECIAL REFERENCE TO THEIR PHYSICAL AND PHOTOCHEMICAL PROPERTIES AND TO ANALYTICAL METHODS

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INTRODUCTION

During the past six years, several excellent reviews which have appeared deal with certain phases of the field of plant pigments. These have been quite detailed, especially from the chemical viewpoint. In this review, only a skeleton outline of chemical properties, sufficient for a discussion of physical properties, will be presented. Most emphasis will be placed upon physical and photochemical properties and upon their significance for a better understanding of the function and behavior of the green and yellow fat-soluble plastid pigments. Photometric analytical methods are stressed because of the recent rapid growth of interest in their application to physiological problems.

No attempt is made to include references to all work relating to plastid pigments reported in the last few years, but instead it is proposed to review briefly the more important papers which recently have come to the writer's attention, and which relate to the limited field discussed above. The divisions of subject matter necessarily overlap somewhat because of interrelations between them.

CAROTENOID

Chemical Relationships and Reactions

The carotenoids comprise a large group of compounds, the most important of which are essentially modifications of the two molecular structures indicated on page 590.1

These were chosen because they occur abundantly in plants and may serve as illustrations for our very short consideration of organic constitution. Carotenoids are nitrogen-free polyene pigments consisting of a long acyclic chain (III) of carbon atoms joined in an uninterrupted sequence of conjugated double bonds. This chain is terminated at both ends by groups which may or may not be cyclized (I and II) and which have isomeric forms. Groups I and II may be different in the same molecule. Carotenoids are divided into several groups:2 the hydrocarbons, such as lycopene

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1 This system of numbering the carbon atoms is employed by Karrer and by Bogert (19).
2 The nomenclature of carotenoids employed in this paper follows the suggestions of Peterson, Hughes, and Payne (213). They suggest the use of the term “carotenol” to indicate a carotenoid which contains oxygen in a hydroxyl group. The older designation of “xanthophyll” expresses nothing concerning the chemical nature of this group of compounds. The terms “carotene” and “carotenoid” are named after the cultivated carrot, Daucus