Chemistry and Biology of the Starch Granule

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With 44 Figures

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I. Introduction

The study of the starch granule concerns biologists and chemists alike, and therefore it is continuously necessary to synthesize the results of both. Neglect of one or the other has led to extreme confusion in the past and the development of fantastic theories. With the advance of our knowledge it has become quite clear that the chemical analysis of isolated starch is one thing, but that synthesis and breakdown of starch in the living cell is quite another. In fact, we still know very little about the latter, which is directly linked with fundamental problems of cell differentiation. In most cases we cannot do very much with the chemical results when we try to apply them to the biology of the living cell. We meet here with intriguing problems, some of which are outlined below.

The starch granules as stored in various plants, have been described often (for drawings see e.g. GASSNER 1955). This article emphasizes the unusual and some less well known facts, because the deviation from the normal often opens the way to the solution of a problem.

It is essential that our ideas about the structure of the starch granules are critically reviewed from time to time. New tools and more careful experiments add continuously to our knowledge. Radioactive carbon and the electron microscope recently gave direct information about the development of starch granules. As in the case of cellulose, these methods were able to confirm conclusions already obtained from indirect evidence, but at the same time the interpretations often require the utmost care.

The factors determining shape, structure and chemical composition of