there the gain in resolving power is at the expense of the truthfulness of the background of the diagram by the introduction of undesirable spurious peaks.

(3) Since the series in equation (4) is convergent, it can be cut off at a suitable high order term without appreciable effect on the calculated values of P_μ. Thus, in contrast with all the Fourier methods, the so-called diffraction effects should be theoretically inappreciable in the new method.

In view of these significant improvements, we conclude that the new synthesis will be able to derive more useful information directly from the observed data than the classical Patterson, and so further narrow down the choice of alternative structures in an actual analysis.

I cannot enter here into many points which are essential for the complete understanding of the method. A detailed account, including the extension to two and three dimensions and the generalization of the method to other classical Fourier methods, will be given elsewhere. The calculation of $a_{\mu h}$'s of a two-dimensional synthesis for $N = 100$ is being undertaken. As a preliminary study and as an illustration, the method has been applied to the analysis of the simple known structure of iron pyrites. The result has been briefly described in *Science Records*[6].

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Enzymatic Production of Bacterial Polysaccharides

SEVERAL investigators have reported the formation of polysaccharide material by sterile filtrates obtained from various species of spore-forming bacilli. Thus in 1910 Beijerinck[1], using 'viscosaccharase', an enzyme present in filtered preparations of *B. mesentericus*, observed the formation of 'slime' on a sucrose-agar medium. In 1930 Harrison *et al.*[2] isolated this enzyme and showed that the 'slime' was a levan. Dienes[3], working with Oerskov's milk-bacillus and with organisms of the *subtilis* group, demonstrated that sterile extracts of these organisms could form from sucrose 'extra-bacterial' granules of a polysaccharide nature. He, too, was probably dealing with a levan-synthesizing enzyme which has now been isolated in an active form from Aerobacter[4].

From *Leuconostoc mesenteroides* Heyre and Sugg[5] isolated in an ingenious manner an enzyme which could synthesize, from sucrose alone, a dextran identical both chemically and serologically with the dextran produced by the living organism. Some time ago in these laboratories we also isolated an extremely active exocellular dextran-synthesizing enzyme from *L. mesenteroides*, but circumstances caused the interruption of the work before our investigations were completed. Inasmuch as we hope to resume the research at some future date we now publish our preliminary results, which initiate a new field of study concerning the symbiosis of yeasts and bacteria.

Our investigations[6] dealt with the search for growth-promoting factors which could stimulate dextran production by Leuconostoc species. We obtained a number of 'slimes' from a beet-sugar factory, and one of these was subjected to bacteriological analysis by Prof. A. J. Kluyver of Delft and was found to contain *L. mesenteroides*, *Saccharomyces cerevisiæ* Hansen and a Streptobacterium, each of which he isolated in pure culture. Since many natural viscous fermentations, such as Kephir and Tibi[7], are due to the symbiotic action of yeasts and bacteria, it occurred to us to grow this strain of *L. mesenteroides* in symbiotic association with *Saccharomyces cerevisiæ*. The growth medium was that described by Stacey and Youd[6] and 5 c.c. quantities were inoculated separately with the yeast and the Leuconostoc and incubated at 30°. After two successive subcultures from the mixed culture there was a remarkable production of dextran, the yield reaching a maximum in forty hours, whereas a period of ten days was required by the *L. mesenteroides* in pure culture to produce its maximum yield. After a third successive subculture it was noted that an opalescence occurred in the medium after one hour, that there was considerable dextran production after four hours, while after ten hours the whole medium formed a gel composed almost entirely of dextran. In the four-hour culture above, microscopic and cultural examination revealed the almost complete absence of both yeasts and bacteria, so that dextran production at this stage was undoubtedly due to exocellular enzymatic action. Confirmation of this was forthcoming from the fact that heavy inoculations from sterile filtrates of twenty-four-hour cultures produced dextran in a few hours on the same sucrose-peptone medium. This production was, however, less dramatic than that obtained by inoculation with an equal amount of unfiltered ten-hour cultures, and there is little doubt that in the latter case the enzyme system was sharply stimulated by a factor elaborated *in situ* by the living yeast cells.

The dextran was of the mucoid type and, after isolation, remained insoluble in water. By the method described by Daker and Stacey[8] it was obtained in a less viscous, water-soluble form, $[\alpha]_D + 180°$ in water, N, 0·5 per cent, and gave only glucose on acid hydrolysis.

The isolation of an enzyme capable of synthesizing a polyglucose having 1 : 6-linkages[9] from sucrose (glucose-1-fructofuranose) would appear to have a significance comparable with Hanes's discovery of the starch-synthesizing enzyme which utilizes glucose 1-phosphate; and further work in this field should lead to an understanding of some of the underlying mechanisms of enzymatic synthesis.

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May 14.

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