

ance, in view of the remarkable fertility of the researches to which it has directly and indirectly given rise."

I need not dilate on the value of these researches to the chemistry of organic substances, but need simply say that this discovery is the basis of the research into the special distribution of the atoms in the molecule, explaining isomerism, etc. But Pasteur's study of the tartaric acids did not end here, fortunately. Ordinary tartaric acid is readily fermentable, and Pasteur studied the effects of fermentation of the various tartaric acids and made the remarkable discovery that while the right-handed (to polarized light) tartaric acid readily fermented, the inactive (racemic) acid only partially fermented, the residue being left-handed tartrate which refused to ferment. Thus he established that the atom grouping of the molecule makes a very important difference physiologically, and this has since been widely recognized in many organic substances. From a study of chemical changes effected by fermentation Pasteur was led to study the cause of fermentation itself. At this period fermentation was not looked upon as a biological process, but as a purely physical one, the predominant idea being that of the chemist Liebig, who was at this time (1850-1860) in his zenith. Liebig taught that "the ferment was an extremely alterable organic substance which decomposed, and, in decomposing, set in motion, by the rupture of its elements, the molecules of fermentable matter." Thus in the ordinary yeasty growth in syrupy solution undergoing fermentation, the change was not due to the vital activity of the yeast, the only influence that the yeast would possess would be that its dead cells, in decomposing, would impart the necessary motion to the sugar molecules to disrupt them and transform them into alcohol. It was recognized by many observers that bacteria, yeasts, moulds, etc., were often found in fermenting and decomposing liquids, but it was held that these were the result of spontaneous generation, having nothing whatever to do with the decomposition, but were simply some of its products.

Now these studies on tartaric acid and its fermentation were spread over a number of years, being taken up when duty permitted. In 1847 Pasteur took his degree of "Docteur es Science," and after acting for some time as an assistant, in 1849 was appointed Professor of Chemistry in the Straasburg Faculty, which position he occupied until the end of 1854. It was while at Straasburg that Pasteur worked out fully the relationships of the tartaric acids and began the study of the causes of fermentation. He also married shortly after going to