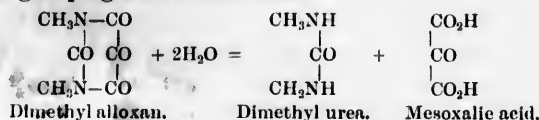


treatment with alkalis, forms dimethyl urea and mesoxalic acid, which contains the grouping above mentioned.

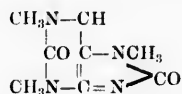


There is also formed at the same time mono-methyl urea. In both these we have groupings which are present in caffeine and the question arises: In which way are they joined together in the alkaloid? This has been found by other decomposition products, *e.g.*, cholestrophan and methyl hydantoin,

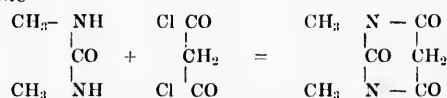
$$\begin{array}{c} \text{CO} < \begin{array}{c} \text{N}(\text{CH}_3)-\text{CO} \\ | \\ (\text{CH}_3)-\text{CO} \end{array} \end{array} \quad \text{CO} < \begin{array}{c} \text{N}(\text{CH}_3)-\text{CH}_2 \\ | \\ \text{NH}-\text{CO} \\ | \\ \text{C} < \begin{array}{c} \text{N}-\text{C} \\ | \\ \text{N}-\text{C} \end{array}$$

both of which contain the ring system previously mentioned.

The breaking up of caffeine into mono methyl urea and dimethyl alloxan is a proof also of the fact that of the ten hydrogen atoms, nine are contained in the molecule as methyl groups, the tenth being peculiar in being replaceable by chlorine, bromine, hydroxyl, or amido groups. Further, the addition of two atoms of bromine clearly shows an unsaturated carbon bond. Fischer from these considerations suggested the formula



for caffeine. Thirteen years after this it fell to Fischer and Ach's lot to synthesise this compound from the consideration of the investigation of Mulder on the reaction between the dimethyl urea and malonic chloride



by which was obtained dimethyl barbituric acid; from this he obtained by means of nitrous acid, dimethyl violuric acid which gave on reduction dimethyl uramil. A. v. Baeyer had at the same time submitted the unsubstituted compound uramil to the action of cyanic acid, expecting to obtain uric acid by the reaction, and had obtained not that body but a pseudo uric acid, in which the second ring system was not closed. On treating dimethyl uramil with melted oxalic acid Fischer and Ach split off the molecule of water and produced dimethyl uric acid. By the action of phosphorus penta chloride on this compound, they obtained a substance which was also obtained on treating theopyllin, a second alkaloid in tea extract with the same