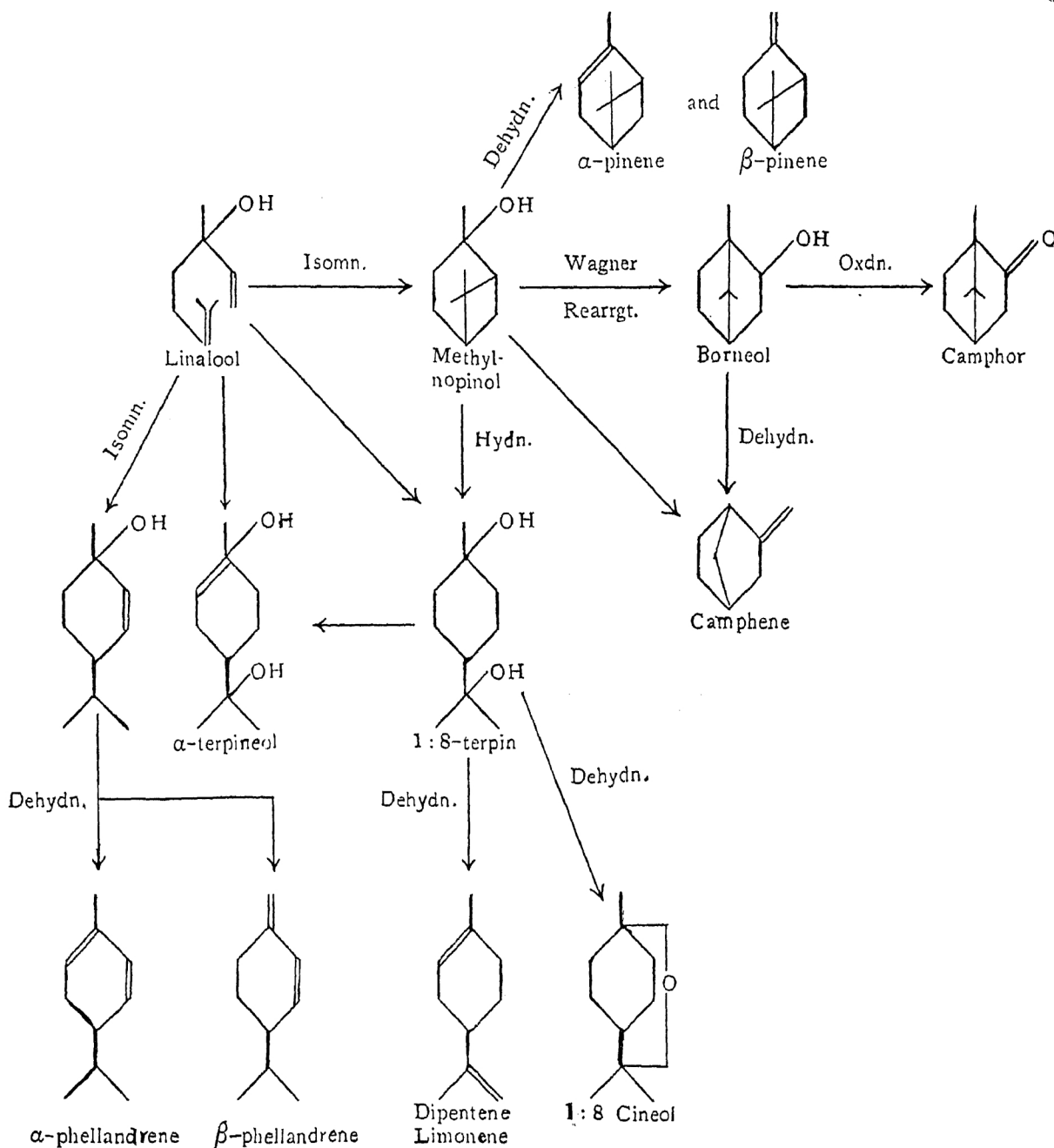


The Biogenesis of the Terpenes.

ADOPTING the view that, in general, the widely distributed terpenes are only indicative of the ease with which the biological



reactions in the plant proceed in the direction of their formation and not suggest that they are functioning as the progenitors of other terpenes, a study of the relative abundance of the terpenes should serve as a clue to understand the biogenetic tendencies in the plant regarding the synthesis of the terpenes. A census taken with this idea furnishes the following data:  $\alpha$ -pinene occurring in 375 oils; cineol in 260; limonene or dipentene in 160; phellandrene ( $\alpha$  or  $\beta$ ) in 126; borneol in 110; camphene in 85; camphor in 70;  $\alpha$ -terpineol in 165;  $\beta$ -pinene in 60 and the others are all occurring in smaller number of oils (the aliphatic terpenes being omitted).

From a knowledge of the general reactions of the various terpenes in our "test-tube experiments" and an analysis of their 'molecular architecture', it is suggested (after trying various possibilities) that linalool can satisfactorily be considered to be the precursor of all the abovementioned widely occurring terpenes. Very significant is the suggestion of Ruzicka<sup>1</sup> that the formation of small amounts of camphor and borneol observed by Winogradov<sup>2</sup> when linalool is heated with activated aluminium, takes place through the intermediate methylpinol, the formation of which from linalool by a double ring closure is now considered to be the trigger reaction in the production of the widely distributed bicyclic terpenes.

The scheme given above shows the probable "general direction of the processes" in the formation of the widely distributed terpenes in nature.

Regarding the formation of the widely distributed linalool (which is very closely related to geraniol, citral, citronellol and citronellal) it seems better to defer speculating till the exact (botanical) mechanism of the formation of the terpenes in the plant is understood.

The above scheme accommodates many facts, the detailed discussion of which as also the mechanism of formation of the other terpenes will shortly be published.

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<sup>1</sup> *Ann. Rev. of Biochem.*, 1932, **1**, 583.

<sup>2</sup> *Ber.*, 1931, **64**, 1991.